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RAMBLES OF A MIDSHIPMAN. III.

BY P. S. REMINGTON, JR.

The second leg of our eighteen-thousand-mile cruise commenced with our departure from Balboa. Nothing untoward occurred to break the even monotony of our run to Honolulu. Very little manoeuvering was done this time, because coal is precious on such a long trip. This was said to be the longest single run ever made by a squadron of battleships, and certainly it seemed an eternity to me, for it was now the turn of our division to serve in the boiler-room and coal-bunkers, and for seventeen mortal days I stoked a boiler. I have already commented on the astonishing amount of coal a battleship can stow away, but this is far less remarkable than the way a boiler can eat it up. Never a cool place, the boiler-room usually showed a temperature of around 130° F. in the latitude of the tropics, and some poor fellow was carried out on deck every watch. Those seventeen days became an era in my life, to be looked back on with wonder and some pride.

However, all things come to an end, and at last we awoke one morning to see the extinct crater of Diamond Head showing up on the horizon. As we steamed up the bay of Honolulu, twenty-two airplanes circled over our tops, dropping aboard "leis", that Hawaiian symbol of welcome. I think that the average American citizen, who is familiar with the Hawaiian Islands chiefly through the popular music which purports

to come from there, pictures Honolulu as a grove of native huts in the midst of palm trees with hula maidens dancing around to the music of ukuleles. At leart, I am inevitably asked if I saw any hula dancers on my trip to Honolulu. As a matter of fact Honolulu looks quite like any other American city with its docks, stores and business district, and native Hawaiians are far less plentiful than Japanese. Indeed they are distinctly a rarity, and although I saw one or two princesses at the naval ball, they danced a one-step and not a hula dance. I was told that there are very few real hula dancers left, and that the only good ones were not fit to be seen.

Nevertheless, there is a certain glamour about Honolulu which impresses one at once. The azure blue of the water, the rugged chains of mountains in every direction, the riot of flowers everywhere and the semi-tropical climate made a deep impression on my memory. I still consider Honolulu the most beautiful city I have ever seen, and vowed to return to it some day for a longer visit.

Before the cruise started I had had the forethought to write to Mr. Charles F. Mant of Honolulu, and the "Connecticut" had no sooner docked than he came aboard and enquired for me. By special dispensation I got permission to take dinner ashore and was treated with real Hawaiian hospitality. This last, it should be remarked, is really a substantial thing, for no midshipman could walk fifty yards along the street without being cordially asked to step into a passing automobile. Certainly I had no reason to complain, for the Mants and some Yankee friends took special pains to procure some strawberries and cook a real New England strawberry short-cake which we ate at Waikiki Beach. I shall long remember that evening.

Here, as elsewhere, I lost the opportunity to collect extensively because I was unable to secure shore leave for more than half a day. We were able to plan two trips, however, which are chalked up on my memory along with those at Panama and Cuba. The first was a hike up Mt. Tantalus along the Manoa Cliff Trail. Exchanging my uniform for khaki clothes loaned by Mr. Mant, I set out in company with that gentleman for this trail, a little beyond the city. The view on

the way up was superb, and I have never seen such beautiful shades of water as the bay showed. Near shore it was a light blue with a white ring of surf, while further out it merged into a deep purple. Below us in the valleys were the neatly cultivated farms of the Japanese, some of them extended well up the hillsides. Way off to the north were other ranges of hills at which I gazed with longing eyes, for in those valleys were the Achatinellas which I had hoped to collect. They were too far away, however, to be reached in the limited time at my disposal and I had to be satisfied with an inspection of the collections of Mr. Mant and Mr. Emerson. The latter gentleman has, judging by the thousands of specimens in his collection, robbed many of the valleys of Oahu of their entire molluscan fauna. The returns on this hike with Mr. Mant were not great, but very interesting because so different from any other collecting I have ever done. In the axis of large-leaved plants we found *Auriculella diaphana* and *Auriculella castanea*, a few *Amastra turritella*, *Philonesia baldwini*, and *Tornatellides procerulus*. Under the rocks by the roadside were a few *Succinea caduca* and the introduced *Eulota similaris*. In spite of the paucity of the species taken, this hike was one of the most enjoyable I have ever made.

The second trip was a visit to Pearl City near the naval base where we got in a little marine collecting along the west locks. Here we took some fine *Nerita picea*, *Trochus sandwichensis*, *Sistrum fasciolatum*, *Litorina scabra*, *Siphonaria normalis*, *Pleurorema inaequalis*, *Lasmodonta sandwichensis*, *Mytilus crebristriatus*, *Cytherea lioconcha*, *Tellina rugosa*, and a small *chiton*. Although this represents about all the species I was able to collect in Honolulu, it should be understood that this was due to the fact that I was never able to get sufficient shore leave to make a long trip, so I blame the naval authorities and not the Hawaiian fauna. The species I collected are but a small fraction of the fauna to be found. Mr. Mant kindly made up this deficiency by generously sharing many of his duplicates with me.

A rather humorous incident took place the next day as we were going through the market. Seeing a huge pile of fine

Tapes philippinarum for sale, I enquired of the Jap on guard what was the price of them. Pointing to one of three plates heaped high with the bivalves, he answered "twenty-five cents." When I nodded at the price, he deftly rolled a huge palm leaf into a cornucopia and poured the entire *three* plates into it. My friends laughed heartily at my discomfiture. They would have laughed still more heartily had they seen me at 2 A. M. still cleaning those shells. I kept every one, however, and got them all home.

After a week's delightful stay, we bade farewell to Honolulu and departed amid a shower of flower "leis" from the cordial islanders. I don't think I have ever been so sorry to leave a port. Its charm remains long after the memory of it has dulled.

We were now bound for Seattle, a twelve-day run. Entering the region of the northeast trade winds, we encountered cool weather and several rough days. Work in the boiler room was now a pleasure, but alas I had been shifted to a deck division, for a midshipman must become familiar with every phase of ship life on these practice cruises. So I spent the days scrubbing decks and polishing brightwork until the snow-covered Olympic range came in sight and we steamed up Puget Sound and dropped anchor in Elliot Bay.

Seattle was the one port in which I knew of no shell collector, but as I had a bona-fide brother living there, I was able to get four days' shore leave, which I made the most of, though not conchologically. Our welcome here was very warm also, for the first mail from shore brought a letter of invitation to each midshipman to dinner and a ball given in our honor. The board of commerce had called for volunteers to take care of us and each car was given a number corresponding to the one on the invitation. They even provided us with partners for the ball.

I made one attempt to collect, but the results were so discouraging that I did not try again. I had been told that there was good collecting at Fort Lawton Beach. No one seemed to know where that was, however, and after spending an afternoon in a vain hunt for it, and finding only a few *Acmaea scutum*

patina, I gave up and enjoyed the more worldly pleasures that my brother offered. Later, after gaining an idea of the Puget Sound fauna through the medium of exchange, I have regretted my inactivity.

Our next port of call was San Francisco where I expected to see that very active collector, Mr. Allyn G. Smith. On my arrival, I was disappointed to find that he was leaving at once for an auto trip through northern California and Oregon, on which he hoped to discover some new things. He did, before he left, recommend a few localities where the collecting might be good and also introduced me to a bit of collecting in his own garden, for the place was overrun with *Helix aspersa*, introduced. On his advice I made a visit to Muir Woods, that home of the big trees, first ascending Mt. Tamalpais on the "crookedest railroad in the world," then down to Muir Woods by gravity car. I had only about a half-hour before the train returned, however, and though I hunted industriously through the redwood thickets, I found only one specimen of *Epiphragmophora infumata*. As this had the epiphragm I think the shells had hidden away through the dry spell. This was the extent of my collecting in San Francisco. I did not get a chance at the marine collecting though I wanted to try Bolinas Bay.

After coaling up once more, we headed south for San Pedro which we soon reached. Here the squadron divided, half going to San Diego, the other half to San Pedro. Fortunately, the flagship stayed at San Pedro. I say "fortunately" because Mr. E. P. Chace, with whom I had been corresponding for many years, lived at Los Angeles and I was planning to pay a visit to him. To further this plan, Mr. Chace wrote me a letter and signed it "Uncle Emory," and I had only to present this to the commander in order to get another forty-eight-hour leave of absence. I felt no compunction in doing this, considering all the fine collecting I had been deprived of through official inhibition.

That visit with "Uncle Emory" is another pleasant memory to add to an eventful cruise. Besides the pleasure of inspecting Mr. Chase's fine collection, we paid a visit to the Southwest Museum, and other points of interest. I had anticipated

a taste of the collecting at San Pedro, but was disappointed to learn that the tides were not right. Mr. Chace, however, invited me to collect among his duplicates, which I gratefully did. I am not one of those, however, to whom a shell is only a shell. A specimen means much more to me if I have collected it, and I promised myself another trip to the West Coast sometime in the future.

After a most enjoyable two days at the Chaces', I returned to my ship and soon we were headed for the Panama Canal again. We picked up the rest of the squadron off San Diego and settled down for another long, hot run. Men in the boiler division, "the blackgang", told us that was the hottest run of the cruise. Fortunately I was still in a deck division. Nevertheless, I was glad when we docked at Balboa again where daily showers cool the air a little. I hastened to renew my acquaintance with Mr. Zetek and this time we made a trip to Punta Paitilla, another favorite collecting ground of his. The collecting here was the richest I have ever seen, and I made the most of it. I had hoped to get leave of absence to go to Taboga Island, where Mr. Zetek assured me the collecting is very fine, but I had exhausted my leaves and failed.

With more than regret, I bade a final farewell to Mr. Zetek and his charming family. The regret was lightened, however, by the fact that we were now going *home* and that the next port was Annapolis where a month's leave awaited us. For the last time we steamed through the Canal and regarded the now familiar sights with almost as much interest as we had the first time. We were not to arrive home without incident, though, for midway between Panama and Cuba the "Connecticut" lost both propellers and had to be towed into Guantanamo by a collier. We were transferred at once to the other ships and steamed north to Annapolis.

Although circumstances made it advisable for me to resign from the Navy two months later, I shall always be grateful for the opportunities I had to collect in various parts of the world, brief and unsatisfactory though they were. And I should like to express right here my appreciation for the fact that conchologists are such prime good fellows, no matter where one meets them.

I know that my cruises were made one hundred per cent more interesting for me because of that spirit of "camaraderie" which exists among them. As one of my correspondents expressed it, "I never knew a shell collector who wasn't first-class in every respect."

BOURGUIGNAT'S AMERICAN SPECIES OF ANCYLUS

BY BRYANT WALKER

At different times and in different places Bourguignat described nine new species of *Ancylus* from Mexico, Cuba and South America. He also proposed new names for three species, whose original names were pre-occupied. These were:

Ancylus haldemani for *A. depressus* Hald. (1844) *non* Deshayes (1824).

Ancylus pfeifferi for *A. radiatilis* Pfr. (1852) *non* Morelet (1851).

Ancylus petitianus for *A. obliquus* C. B. Ads. (1850) *non* Broderip and Sowerby (1832). Adams, however, had before that discovered the duplication and renamed his species *A. chittyi* in 1851, so that Bourguignat's name falls into the synonymy.

Of the nine new species described, Bourguignat himself only figured two. Three others have been figured by later authors from specimens in their own or other European collections.

With one exeeption, *A. charpentierianus*, all of Bourguignat's types are in his collection now in the Museum of Natural History of Geneva, Switzerland.

The great rarity of the species, the lack of figures and the author's well-known proclivity to unduly multiply species upon slight differences have rendered the determination of his species extremely difficult and they have always been a source of perplexity to students of that group.

Some time ago Dr. G. Mermod of the Geneva Museum very kindly sent to me a series of excellent, enlarged photographs of all of the American types in the Bourguignat collection.

This included still more enlarged views of the apices and he added notes of his own examination of the specimens in regard to their apical sculpture. He also sent photographs of Bourguignat's original labels, which accompany the specimens. These photographs, while quite sufficient for examination themselves, are not strong enough for half-tone reproduction and I have accordingly had them redrawn by Miss Mina L. Winslow of the Museum of Zoology of the University of Michigan. These drawings have been very skilfully and accurately done and leave nothing to be desired as reproductions of the original photographs.

These figures add greatly to our knowledge of the several species and are now published to assist students in their identification of the Bourguignat species. I have added such notes from the literature as seemed applicable. As the original descriptions are scattered in various publications not always readily accessible, it had been deemed advisable to reproduce them here for convenient use with the figures.

I. Ancylus chittyi C. B. Ads. Pl. I, figs. 1-4.

Ancylus obliquus C. B. Adams, Ann. Lyc. Nat. Hist. N. Y., 1850, p. 48; Contr. Conch., 1850, pp. 132, 187, *non* Broderip and Sowerby, 1832.

Ancylus chittyi C. B. Adams, Contr. Conch., 1851, p. 204; Fischer, Rev. Cal., 1858, p. 15; Bourguignat, Spic. Mal., 1862, p. 221; Clessin, Conch. Cab., Ancylinen, 1882, p. 54, pl. 8, fig. 10; Maze, J. de Con., XXXI, 1883, p. 29.

Ancylus petitianus Bourguignat, J. de Con., IV, 1853, p. 172, pl. 6, fig. 10; P. Z. S., 1853, p. 85; Amen. Mal., I, 1853, p. 11.

Original description:—"Shell subovate, somewhat arcuate, very convex; translucent, pale horn-color; extremely thin, with microscopic radiating raised lines and less distinct striæ of growth; apex very prominent, elevated, extending very far to one side and posteriorly, and projecting nearly over the margin. Length .075 inch; breadth .05 inch; height .028 inch."

Type locality: Jamaica.

Adams' type was an unique specimen in the Chitty collection now in the British Museum. I am informed by Mr. H. C. Fulton that it was glued to a tablet and has been crushed to pieces so that it is now impossible to make anything of it.

Apparently, however, Bourguignat obtained another specimen, which he figured. There is nothing to show from whom he obtained it. This specimen is of special interest not only because it is the only example of the species ever figured, but also because it extends the range of the South American genus *Hebetancylus* into the West Indias.

In response to an inquiry from me, Dr. Mermod replied: "In regard to the *Ancylus chittyi* (*petitianus*) you ask if the figure given in the Journal de Conchyliologie was made from the original in the Bourguignat collection. You will see in examining the photograph that it is not possible to reply with certainty to the question. The figure in the Journal is quite conventional and does not correspond in all respects with the type, which, however, is unique in the Bourguignat collection." There would, however, seem to be but little doubt that the specimen here figured was the original of the "conventional" figure in the Journal.

The excellent photographs sent by Dr. Mermod leave no doubt as to the systematic position of the species. He states also that the apex is "distinctly radially punctate". It is therefore an *Hebetancylus* and is the first record of that genus in the West Indias. The resemblance to the *Burnupia caffra* (Krss.) from South Africa is very striking.

Clessin's figure is stated to be from an example in the Dohrn Collection, so that at least two specimens have reached Europe in addition to Adams' type.

According to Fischer and Maze (l. c.) it is also found in Guadeloupe. But see, Walker, Naut. XXXIII, 1920, p. 99.

II. Ancylus charpentierianus Bourguignat.

Ancylus charpentierianus Bgt., J. de Con., IV, 1853, p. 173, pl. 6, fig. 12; Clessin, Conch. Cab., Ancylinen, 1882, p. 56, pl. 8, fig. 12.

Original description: — "Anc. testa convexa ac concava;

muerone dextrorsus obliquo; depressione apicali minutissima, sat rotundata, in verticis extremitate ac paululum ad sinistram versa. Parva, depressa, luteola, intus albido vel luteolo-rosacea, striis radiatis subtiliter ornata; apertura anteriore rotundata, posteriore ovato-subangulata. Long. 5.5; lat. 4.5; alt. 2 mm."

Type locality: Valparaiso, Chile.

This species is not represented in the Bourguignat Collection, the type having been received from M. Petit de la Saussaye, the then editor of the Journal de Conchyliologie. No details are known of the apical sculpture. Judging from the figure it is probably an *Uncancylus*. Clessin considers the sharp angle of the posterior margin abnormal. The species as described and figured is unusual in the concave outline of the anterior slope towards the margin, but that too may possibly be abnormal.

Clessin's figure is a copy of that of Bourguignat.

III. Ancylus plæarius Bourguignat. Pl. I, figs. 5-8.

Ancylus plæarius Bgt., Spic. Mal., 1862, p. 214; Clessin, Conch. Cab., Ancylinen, 1882, p. 72.

Original description: — "Testa gibboso-depressa, ad latera contracta, elongata, pellucida, fragilima, cornea vel translucida, concentrice vix striatula; antice sinistrorsus-queconvexa; postice dextrorsusque recta; apice postico, obtusissimo, dextrorsus dejecto; depressione apicali rotundata vel saepe lunari, ad partem inferiorem verticis sita; apertura elongata, ad latera coaretata; marginibus lateralibus paululum arcuatis. Longueur 10; hauteur 3 mm."

Type locality: Lake Baril, Bahia, Brazil.

The author says that he received this shell from Moricand under the MSS. name of *A. moracandi contracta*. As stated by Clessin, it is probably only a narrow form of that species.

Moricandi is the type of *Hebetancylus* Pils. (Proc. A. N. S. P., 1913, p. 671).

Dr. Mermod writes that the "apex is without granulation". But a close inspection of his photograph indicates that the apex was apparently somewhat eroded, and if so, the minute apical sculpture would have disappeared.

IV. Ancylus aorus Bourguignat. Pl. I, figs. 9-11.

Ancylus aorus Bgt., Spic. Mal., 1862, p. 216; Clessin, Conch. Cab., Ancylinen, 1882, p. 70.

Original description:—"Testa magna, gibboso-oblonga, pellucida, fragili, cornea, concentrice striatula; antice perconvexa ac concava, postice recta ac concava, sinistrorsus convexa ac concava, dextrorsus concava; apice valde postico, obtusissimo (depressione apicali inconspicua), ad dextram dejecto; apertura oblongo-ovata; marginibus expansis, antice sinistrorseque praesertim dilatatis. Longueur 11; hauteur 3.5 mm."

The author remarks that the *A. aorus* is very close to *A. moricandi*, but differs by its manner of growth, by its shell "excessively swollen and like the back of an ass," by its apex more posterior, very obtuse and more turned to the right, and especially by its aperture, the margins of which are wide, dilated and almost reflected, which is never seen in the true *moricandi*.

Type locality: Environs of San Pedro, Brazil.

Clessin considers it as probably only a variety of *moricandi* with an unusually extended peritreme, which is very likely correct.

As shown by the figure, the apex is too much eroded to show the sculpture.

V. Ancylus plagioxus Bourguignat. Pl. II, figs. 1-3.

Ancylus plagioxus Bgt., Spic. Mal., 1862, p. 217; Clessin, Conch. Cab., Ancylinen, 1882, p. 70.

Original description:—"Testa depresso-ovata, parvula, fragili, cornea, pellucida, concentrice radiatimque argutissime striatula; antice sinistrorsusque convexa; postice dextrorsusque concavo; apice postico, acutissimo, dextrorsus dejecto; depressione apicali oblonga, ad partem superiorem verticis sita; apertura ovata. Longueur 6; hauteur 2 mm."

Type locality, Lake Baril, Bahia, Brazil.

The author remarks that the apex is exceedingly small and very sharp.

Dr. Mermod gives no note on the apical sculpture and none

can be detected on the photograph, consequently no assignment to modern groups can be made. It is possible that on critical examination it might prove to be a young *A. moricandi.*

VI. Ancylus saulcyanus Bourguignat. Pl. II, figs. 4-7.

Ancylus saulcyanus Bgt., P. Z. S., 1853, p. 192, pl. 25, figs. 26-33; Spic. Mal., 1862, p. 218; Clessin, Conch. Cab., Ancylinen, 1882, p. 71, pl. 6, fig. 6.

Original description:—"Anc. testa antice convexa, postice paululum concava; apice parvulo, postico, sat obtuso, dextrorsus dejecto, saepe decorticata; depressione apicali rotundata, in verticis extremitate sita. Testa parva, fragili, cornea, concentrice striatula, ac argutissime radiatula, praesertim ad aperturam; apertura ovata. Long. 4-4½ mill., lat. 3, alt. 2."

Type locality: Environs of Porto Cabello, Venezuela.

The author remarks:—"Le test de *l'Ancylus saulcyanus* est d'une taille petite, fragile, d'une coleur corné, et presente des stries d'accroissement assez bien marquées. Lorsqu'on l'examine au microscope, il parait, de plus, radié avec la plus grande delicatesse. Son overture est ovale."

The erosion of the apex as shown by the figure is too great to show any of the apical sculpture, and consequently its exact generic position is uncertain.

The author in the Spic. Mal. (l. c.) differentiates it in detail from *A. raymondi* Bgt. (Algeria), *chittyi* C. B. Ads., *obliquus* B. and S. (Chile), *charpentierianus* Bgt. and *irroratus* Gldg. (St. Vincent).

Clessin's figure is not a copy of that in the P. Z. S., but is a narrower shell, similar, but less dilated anteriorly, the lateral margins being nearly parallel. His dimensions are also different. The source of his specimen is not given. He groups it with *concentricus* d'Orb., *culicoides* d'Orb. and *barilensis* Moric., "from which it differs in the shape of the aperture." The last named is the type of *Uncancylus* Pils. (Pr. A. N. S. P., 1913, p. 671).

Dr. Mermod's larger figure is quite typical, the other is narrower.

VII. Ancylus beaui Bourguignat. Pl. II, figs. 8-10.

Ancylus beaui Bgt., J. de Con., IV, 1853, p. 176; Spic. Mal., 1862, p. 230; Shuttleworth, Diagn. Neuer Moll., 1854, p. 158; Clessin, Conch. Cab., Ancylinen, 1882, p. 69, pl. 7, fig. 10.

Original description:—"Anc. testa antice parum convexa, postice recta vel concava; apice sat obtuso, postico, excentrico, dextrorsus sito; depressione apicali minutissima, rotundata, in mediana muerone vertieis sita. Parva, depressa, fragili, diaphana, levi, luteola; apertura ovato-elliptica. Long. 4-5 mill.; lat. 2½, 3½ mill.; alt. 2¼ mill.

Var. B. Testa paululum majore, elatiore; apertura elliptica."

Type locality: Marshes of Guadeloupe.

Shuttleworth (l. c.) lists this species from near Luquillo, Porto Rico, with a "?", and remarks that it is wider, more depressed and perhaps thinner than *A. obscurus* Hald.; but also distinct from *A. fuscus* C. B. Ads. Clessin states that the species is in the Berlin Museum as from that locality. It is probable that his figure was drawn from an example in that collection. It agrees fairly well with Bourguignat's type.

Dr. Mermod makes no note on the apical sculpture, as the apex is badly eroded.

Bourguignat in his description says that the shell is smooth, but the photograph, considerably enlarged, shows distinct radial striation.

VIII. Ancylus complanatus Bourguignat. Pl. III, figs. 1-3.

Ancylus complanatus Bgt., Spic. Mal., 1862, p. 231; Clessin, Conch. Cab., Ancylinen, 1882, p. 26.

Original description: — "Testa ovata, fragili, pellucida, vitracea, pallide cornea, laevigata vel sub lenteargutissime concentrice striatula; antice convexa; postice sinistrorsus ac dextrorsus parum convexiuscula; apice obtusissimo, paululum postico ac dextrorso, fere centrali; depressione apicali magna, postico, in extremitate verticis sita; apertura ovata. Longueur 5; hauteur 1½ mm."

Type locality: Cuba.

Dr. Mermod states that no apical sculpture was visible.

IX. Ancylus sallei Bourguignat. Pl. III, figs. 4-6.

Ancylus sallei Bgt., Amen. Mal., II, 1857, p. 32; Spic. Mal., 1862, p. 231; W. G. Binney, L. and F. W. Shells, N. Amer., II, 1865, p. 142; Strebel, Beitr. Kent. Mex. L. and Sussw. Conchylien, 1873, p. 63, pl. 4, fig. 35; Clessin, Conch. Cab., Ancylinen, 1882, p. 25, pl. 6, fig. 9; Fischer and Crosse, Miss. Sci. Mex., Moll., II, 1880, p. 38, pl. XXX, figs. 17-17b; v. Martens, Biol. Cent. Am., Moll., 1899, p. 401.

Original description:—"Testa antice convexa, postice recta vel paululum convexa, sinistrorsus convexa, dextrorsus recta; apice postico, ad dextram dejecto, obtusissimo, nullo. Minuta, fragillima, diaphana, argutissime sub lenteradiatilis, succinea; apertura oblonga. Haut. 1½; Long. 5; Larg. 2 mm."

Type locality: La Laguna Larga de Toxpam, near Cordova, State of Vera Cruz, Mexico.

The author remarks that the apex is so obtuse that its extremity is completely indistinguishable.

Strebel's unique specimen was collected at Vera Cruz, Mexico. He states that the apex is smooth.

Clessin's figure is a copy of that of Strebel and he "has no doubt" of the correctness of the latter's identification.

Fischer and Crosse state that Strebel's specimen is much smaller than the type, but has the characters of the species. But von Martens notes some discrepancies both in the measurements and figures of the Fischer and Crosse and Strebel specimens (assuming apparently that the former's figure was drawn from an authentic example), and infers that "it is not quite certain that the shells obtained by Sallé and Strebel belong to one and the same species."

Both of these figures differ considerably from the type as here figured.

The apex of the type is too much eroded to show the sculpture.

Bourguignat (Spic. Mal., l. c.) states that he has also re-

ceived the species from Poey, collected in the marshes of Cardenas, Cuba.

X. Ancylus adelinus Bourguignat. Pl. III, figs. 7-9.

Ancylus adelinus Bgt., Spic. Mal., 1862, p. 227; Clessin, Conch. Cab., Ancylinen, 1882, p. 70, pl. 8, fig. 11.

Original description: — "Testa oblonga, fragili, pellucida, vitracea, pallide fusco-cornea, argute concentrice que striatula, ac sub lentestriolis radiantibus minutissime ornata; antice sinistrorsusque convexa; postice dextrorsusque fere recta; apice posticoobtusissimo, sicut calieulato ac dextriorsus dejecto; depressione apicali rotunda, minutissima, in extremitate vertieis sita; apertura oblonga. Longueur 5½ mill., hauteur 2½ mill."

Type locality: Cuba.

Clessin lists the species from "Poey and the Dohrn collection," meaning, probably, that it was in the Dohrn collection received from Poey, and his figure was probably drawn from a specimen from that source. It is quite different in shape from the specimens in the Bourguignat collection. There are three of these, which measure: 4.30 x 3.10, 4.08 x 2.98 and 4.03 x 2.79 mm., the proportion of the width to the length being respectively, 72.1%, 73% and 69.2%, with an average of 71.4%.

According to Clessin's figure the proportion of width to height is 48%. That is, the specimen figured by him is proportionately only two-thirds as wide as the specimen of *adelinus* here figured. It is a much narrower shell and the lateral margins are nearly parallel.

There is evidently some mistake here somewhere. But just where it is, or how it occurred, it is now impossible to say. But the discrepancy is too great to render it at all probable that, if accurately drawn, the specimen figured by him is really *adelinus*. Possibly Poey made a mistake in identifying the shell sent to Dohrn as that species.

The specimen here figured is the largest one in the Bourguignat collection.

Dr. Mermod notes that "the apex is distinctly punctate, but not radially." The species is therefore probably an *Hebetancylus*.

Explanation of Plates.

Plate I.

Figs. 1-4. *Ancylus chittyi* C. B. Ads.
(3, apex; 4, surface sculpture.)
" 5-8. *Ancylus plœarius* Bgt.
(5 and 6 different specimens; 8, apex.)
" 9-11. *Ancylus aorus* Bgt. (11, apex.)

Plate II.

" 1-3. *Ancylus plagioxus* Bgt.
" 4-7. *Ancylus saulcyanus* Bgt.
" 8-10. *Ancylus beaui* Bgt.
(Figs. 6 and 9 represent apices.)

Plate III.

" 1-3. *Ancylus complanatus* Bgt.
" 4-6. *Ancylus sallei* Bgt.
" 7-9. *Ancylus adelinus* Bgt.
(Figs. 3, 6 and 9 are apices.)

COLORADO PISIDIA

BY V. STERKI

For a number of years, Prof. Junius Henderson has been collecting mollusks in the mountains of Colorado and adjoining states, and in the summer of 1921 has carried through a careful, thorough survey of several counties, such as had not been made anywhere in the State before. The *Sphæriidæ*, nearly 11,000 specimens, mostly of *Pisidium*, were from about seventy stations, mostly at high altitudes, and proved very interesting. There were a surprisingly large number of species and forms. Those from every station had been left

mixed up as collected, just what is needed for studying the several species, their interrelations and variation.

In this article some new species are described, and added is a list of the others found in the state, with a few pertinent notes on systematics, variation and distribution. As Prof. Henderson expects to publish a list of the mollusca of the Rocky Mountain States, localities are cited here only in a few instances. The numbers of lots cited are those of the special *Sphæriidæ* collection in the Carnegie Museum; and for the new species it is understood that cotypes are in the collection of Prof. Henderson, Univ. of Colorado.

New Species.

PISIDIUM COLORADENSE, n. sp.—Mussel subequipartite, subtriangular, barely or not oblique, medium inflated; beaks slightly behind the middle, narrow and slightly prominent, somewhat flattened around the center and with a slightly marked crest (wanting in some specimens); dorsal margin short, curved; supero-anterior slope slightly or barely marked, anterior end rounded or subangular; posterior margin subtruncate obliquely outward, marked off from the dorsal by a slight, rounded angle more marked in younger specimens than in old; ventral margin moderately curved; surface dull to slightly glossy, microscopically rugulose, with fine, crowded, subregular, somewhat sharp riblets and a few slightly marked rest-lines; color whitish, periostracum thin, shell opaque; hinge rather long, curved-angular, rather stout, plate rather short and broad with the inferior edge projecting; cardinals rather long; c3 curved to angular, mostly emarginate in the middle, its posterior end slightly bifid with the shanks again connate at the end and merging into the projecting plate edge, inclosing a deep excavation below; c2 rather large, with base curved, the free edge forming a regular semicircle or nearly so; c4 oblique, rather long, and so is its edge; laminæ rather long, aI rather massive, its cusp near the middle, pointed, with the slopes gradual and about equal; aIII ¼ to ⅓ the length of aI; pI with cusp slightly pointed, not abrupt, pIII ⅓–½ as long as pIII; aII with apex pointed, slopes

rather abrupt, the distal one more so, pII similar, smaller; ligament medium long, rather thick.

Long. 5.4, alt. 4.7, diam. 3.3 mm., the largest ex. on hand.

Long. 4.5, alt. 3.8, diam. 2.6 mm.; others, may be not full grown.

Hab.: Small rivulet east of Boulder, Colo.; there were over 150 specimens in the lot, rather uniform; no other Pisidia. Types No. 9844, C. M.

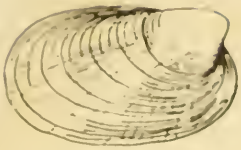
The species is evidently of the *compressum* group, as evidenced by its shape, surface sculpture and hinge, but distinct from that species: different from all its many forms.

Pisidium probum, n. sp.—Mussel slightly elongate, subtriangular, somewhat inequipartite, medium inflated, beaks somewhat posterior, rather broad, rounded, slightly or not mamillar, moderately projecting, dorsal margin short, curved, not marked off by angles, supero-anterior slope slightly marked in adolescent, barely so in full-grown exs., in which the anterior end is more broadly rounded; posterior margin subtruncate to rounded, ventral rather well and regularly rounded; surface somewhat glossy with the striæ fine, crowded, irregular and somewhat sharp, and a few rest-lines; color straw or light yellowish to corneous; shell subtranslucent, rather thin; hinge curved, rather slight, plate moderately broad with the lower edge somewhat projecting; cardinals well above the edge: c3 medium curved, with its posterior end bifid, and a distinct excavation below; c2 rather long with base curved to angular, apex more or less pointed; c4 oblique, rather long, curved; both c2 and c4 well projecting; lamellæ: aI not much projecting inward, its cusp about in the middle, pointed with slopes moderately steep, aIII about $\frac{1}{3}$ the length of aI; pI and pIII similar; aII and pII with cusps pointed, more abrupt; ligament moderately long and thick.

Long. 5, alt. 4.3, diam. 3.3 mm. (largest).

Long. 4.6, alt. 4, diam. 2.6 mm.

Hab.: Roaring Fork, above Aspen, Pitkin Co., Colo., collected July, 1917. There were hundreds of specimens in the



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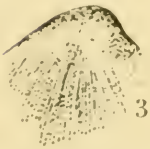

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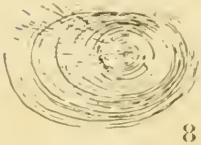

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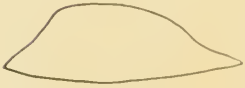

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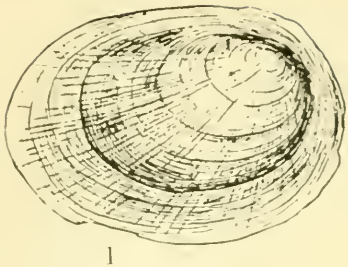

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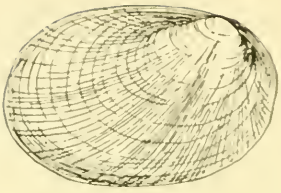

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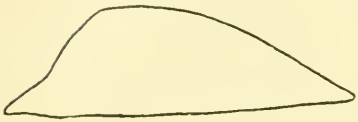

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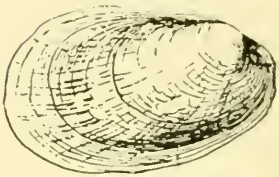

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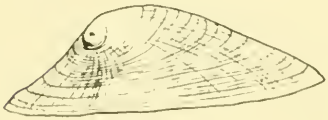

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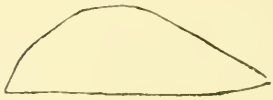

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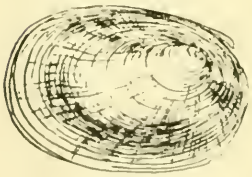

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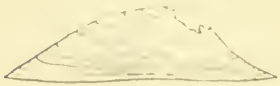

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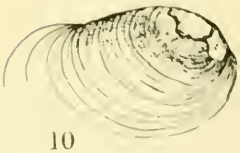

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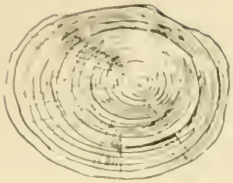

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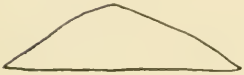

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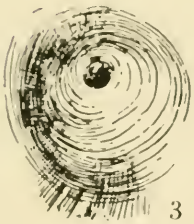

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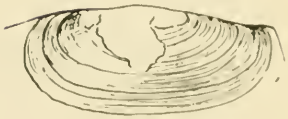

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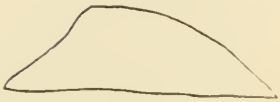

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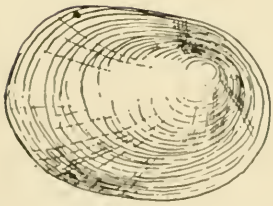

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WALKER: BOURGUIGNAT'S AMERICAN ANCYLI.

lot, from young to old, and rather uniform; no other *P.*— Types No. 9693, C. M.

This species is different from all described and appears not to be closely related to any other. In outlines it is somewhat like *coloradense*, though not of that group; differs by the much broader beaks, the surface sculpture and appearance, and the hinge which is somewhat characteristic but shows some variation. Most of the specimens are of rather dark color, apparently browned in drying.

Pisidium lucidum, n. sp. — Mussel slightly elongate, subequipartite, not oblique, short oval to subelliptical without any angles, well to strongly inflate; beaks slightly or barely posterior, rounded, somewhat mamillar, moderately projecting; dorsal margin short; surface polished with very fine, crowded, irregular striæ; color light to darker corneous to grayish or brownish, often with narrow, irregular lighter zones; usually a few rest-lines; shell thin, transparent to translucent and even apparently opaque; hinge moderately long and stout, plate somewhat broad, cardinals well up on it: c3 rather short, strongly curved, often somewhat emarginate in the middle, its posterior end bifid; c2 small, short, with base curved, apex rounded; c4 oblique, mostly longer than c2, slightly to strongly curved; laminæ: aI rather long and stout, cusp about in the middle, pointed with the slopes rather steep, aIII short and small; pI rather short, with cusp similar, pIII $\frac{1}{3}$–$\frac{1}{2}$ the length of pI; aII with cusp short, pointed, proximal slope rather steep, distal abrupt, pII similar; ligament medium long and thick.

Long. 4.5, alt. 4, diam. 2.7 mm. ("typical" form).

Long. 6, alt. 5.2, diam. 4.2 mm. (large form from other place).

Hab.: Quite a number of places, rivulets, small beaver ponds, etc., at least at some "among dense plant growth," mostly at high altitudes; evidently abundant: from most stations there were hundreds, altogether more than 2300. Those taken for types were from a roadside pool at Buena Vista, Chaffee Co., Colo., collected in July, 1917; No. 9691, C. M.— Also seen from other states.

This is evidently an undescribed species, the affinities of which are under doubt. It is peculiar by its shape, size, the transparent (or translucent) shell and the hinge, especially the cardinals. It is somewhat variable, and at least from one station there are rather different forms. From its size and appearance it might be taken for a lake form.

Pisidium mirum, n. sp. — Mussel subequipartite, oval to elliptical, strongly and evenly inflate; beaks little posterior, broad, rounded, slightly or moderately projecting; surface glossy with slight, shallow, irregular striæ and a few rest-lines, color white to straw, in some forms light grayish or corneous, shell rather thin, opaque or translucent; hinge short, moderately stout, plate medium broad; cardinals small, short: c3 slightly curved to nearly straight, its posterior part markedly short, bifid; c2 rather high up on the plate, with base straight or nearly so, somewhat oblique, abrupt, strongly curved upward, apex rounded or subtruncate; c4 slightly oblique and curved, extending forward over ½–⅔ of c2, much less projecting than c2; laminæ short, rather stout: aI close to the cardinal, strongly projecting inward, its cusp about in the middle, pointed, with slopes about equally steep, aIII about ¼–⅓ the length of aI; pI with well-marked cusp, quite abrupt distally, pIII small; aII and pII with cusps quite short and abrupt; ligament short, rather thick.

Long. 4.4, alt. 3.7, diam. 3.2 mm. (of 9834).

Long. 4.2, alt. 3.7, diam. 3.4 mm., from other place.

Hab.: Lakes and ponds, quite a number of stations, with over 200 specimens seen, mostly from the vicinity of Silver Lake; types No. 9834, C. M. The typical form is somewhat like short *P. roperi* St., also like small *ovum*, but on close examination the two are quite different and distinct. The species is rather variable, though from every station the mussels are rather uniform; there are forms with the beaks narrower and more prominent, the surface is rougher, and the color corneous, and they appear to be of a distinct species.

Pisidium henderson, n. sp. — Mussel small, inequipartite, medium inflate; beaks somewhat posterior, broad, rounded to

flattened, moderately projecting; dorsal margin little curved, bounded by angles, supero-anterior slope somewhat marked, rather short, anterior end rounded angular, posterior margin subtruncate, inferior moderately curved; surface dullish or slightly glossy, very finely microscopically rugulose, striæ very fine, crowded, barely noticeable over the beaks, slightly coarser towards the margins; color whitish to straw, shell thin, opaque; hinge moderately curved, very slight, plate quite narrow; cardinals small: c3 slightly curved, its posterior end somewhat thicker and slightly bifid, c2 on or close to the plate edge, short, straight, with apex rounded, c4 quite small and short, with its position somewhat variable; laminæ slight: aI with cusp somewhat distal, pointed, not abrupt, pI more distal with cusp small, aIII about ⅓ the length of aI, pIII ⅓–⅔ the length of pI; aII with cusp distal, pointed, quite abrupt distally, pII less so; ligament rather long, occupying nearly the whole "width" of the plate.

Long. 3.2, alt. 2.8, diam. 2.1 mm.

Hab.: Upper Forest Lake, at timber line, northwest of Tolland, Boulder Co., among coarse gravel; there were about 200 specimens in the lot, with no other Pisidium. Types No. 9775, C. M.

The mussels are rather uniform, yet with some significant differences: some examples have the beaks flattened, even to form ridges; the hinges, especially the cardinals, show differences in details. This is a rather peculiar species, apparently not closely related to any other, and dedicated to its discoverer.

List of Additional Species.

Pisidium compressum Prime, scarce, from few places, rather different forms.

P. variabile Prime, frequent, from about ten stations; markedly different forms: some much like eastern, others quite small, with narrow beaks; nothing like the very large forms from Washington.

P. occidentale Newcomb, somewhat scarce and apparently not characteristic.

P. huachucanum Pilsbry & Ferriss (not a form of *abditum!* apparently nearer *occidentale*); several places but apparently rather scarce.

P. roperi Sterki, rather frequent, as in Montana; much like eastern forms.

P. pusillum (Gmelin) Jenyns, apparently: just like specimens from England, etc. Not noted before as Nearctic; probably to be looked for in the North (specimens from northern Indiana are apparently identical). Diamond Lake, near Eldora, at alt. 10,960 ft.; apparently also: Lower Los Lagos, Rollinsville.

P. ovum Sterki, frequent, from a number of places; generally somewhat smaller than those from Montana.

P. marci St., apparently the same as the originals from Utah, though of somewhat different appearance; from quite a number of stations and different forms, with respect to shape, size and color.

P. lermondi Sterki, in a slough above Minturn, Eagle Co.; just like specimens from New England, Ontario and Michigan.

P. milium Held, from two stations, fine, characteristic specimens.

P. imbecille Sterki, in a creek above Wolcott; over a hundred examples.

P. abortivum Sterki, near Silver Lake; appears to be widely distributed in the West.

P. rotundatum Prime, several stations, rather different forms, some not characteristic, and under doubt.

P. parvulum Clessin—apparently, from a number of stations; also seen from Montana and Washington. At least some of them are just like European *parvulum;* not previously noted as Nearctic.

P. costatum Sterki, from a small Forest Lake, northwest of Tolland. Apparently identical with the fossil mussel from marl deposits in Maine, Michigan and Illinois, known since 1895, with the ribs slighter. Now seen for the first time as recent.

P. ventricosum Prime, or nearest to that; somewhat different forms. From quite a number of lakes.

NOTE ON LYMNÆA HEMPHILLIANA (BAKER)*

BY G. DALLAS HANNA

Limnæa reflexa hemphilliana Baker, Nautilus, Vol. 18, 1904, p. 11.

Galba reflexa hemphilliana (Baker), Chicago Acad. Sci. Special Publ. No. 3, 1911, p. 342, pl. 36, figs. 19-20.

This species was described from two specimens in the collection of Dr. Bryant Walker; and they had been collected by Henry Hemphill in Lake Albert Lea, Freeborn County, Minnesota. When the monograph of North American Lymnæidæ was published in 1911 no additional material had been studied and Baker stated, "A good series of this race is a desideratum."

An examination of the Hemphill Collection, now in the California Academy of Sciences, shows that the original lot consists of 28 specimens. These were segregated as to size and minor variation in accordance with the custom of the collector into seven lots, numbered 6742-6745 and 6748-6750. The specimens conform reasonably close to Dr. Baker's description and figures. It does not appear that intergradation can be shown with certainty with *reflexa;* therefore subspecific relationship might better not be inferred. The following measurements will aid in the determination of the species:

Altitude	*Diameter*	*Altitude of aperture*	*Catalogue number*
35.8	14.3	16.	6743
38.	14.2	18.8	
39.6	15.9	18.4	
38.	15.	18.3	
34.1	13.3	18.1	6744
33.6	14.8	17.3	
30.9	14.1	16.9	
30.4	13.2	16.4	

* Published by permission of the California Academy of Sciences.

Altitude	*Diameter*	*Altitude of aperture*	*Catalogue number*
29.1	11.6	15.1	6745
29.6	11.9	13.8	
27.	11.6	13.5	
24.4	10.1	11.6	
29.	11.2	13.	6748
28.3	11.1	12.1	
29.5	11.5	13.	
25.1	10.7	12.8	
29.	12.1	14.1	6749
31.2	12.4	14.2	
28.	11.8	13.2	
25.	10.	11.4	
25.	10.2	12.	6750
22.6	9.8	11.3	
23.3	9.3	11.	
20.8	8.7	10.6	
34.2	14.3	16.	6742
34.8	15.1	16.7	
33.2	14.3	17.1	
25.	10.8	11.1	

Hemphill associated the species with *umbrosa* = *clodes* (vide Baker) and *zebra* = *exilis*, but the resemblance is superficial. He collected a set of specimens in the same lake which he referred definitely to the last species, and apparently with correctness. They measure:

Altitude	*Diameter*	*Altitude of aperture*	*Catalogue number*
29.5	10.5	13.9	6751
28.8	9.8	12.7	
22.3	8.2	10.5	

It will be seen that the measurements do not intergrade with those of *hemphilliana*. The latter seems closest to *lanceata* Gould, but has a greater diameter and longer aperture, and the same characters separate it from *reflexa* and *exilis*.

This note is written not only to call attention to *L. hemp-*

hilliana but to a wealth of similar material in the great collection which Hemphill assembled. He seems to have distributed duplicates rather sparingly and these were selected from his poorer specimens. His field work resulted in the discovery of a great number of new species, many of which are represented only by a few known specimens, as in the case of this *Lymnæa*. In almost every case, however, he retained a good series of his best specimens for his own collection. This is now available for legitimate study and research in the California Academy of Sciences.

PLEISTOCENE FRESHWATER MOLLUSKS FROM NORTH CENTRAL TEXAS

BY G. DALLAS HANNA

Through the kindness of Dr. J. A. Udden, Director of the Bureau of Economic Geology and Technology of the University of Texas, I have recently had the opportunity to study interesting and well-preserved freshwater fossil mollusks from Wilbarger County, North Central Texas. The material was collected by Mr. E. B. Stiles, Petroleum Geologist.

Locality 1. *Pomatiopsis lapidaria* (Say).
The fossils came from greenish white clay covered by 20 feet of sandy shale; one mile north of Pease River, 4½ miles N. E. of Vernon, Wilbarger County, Texas; elevation 1214 feet; Sec. 25, Blk. 12.

Locality 2. *Planorbis trivolvis* Say.
Physa gyrina Say.
Lymnæa catascopium (Say).
Lymnæa palustris (Muller)
The fossils came from greenish clay directly overlying Permian rocks; south bluff of Red River, N. E. Cor. Sec. 42, Blk. 12, north of Vernon, Wilbarger County, Texas; elevation 1210 feet.

The formation from which these shells came is a Pleistocene lake deposit of very considerable extent which has been

named "Seymour beds" by Cummins.[1] Vertebrate fossils have been found in it but this appears to be the first record of mollusks.[2] Several of the species are of decidedly northern habitat at the present time and the finding of them in Texas goes further to show the southward extension of the Hudsonian fauna during the Pleistocene.[3]

ON THE IDENTITY OF SAXIDOMUS BREVISIPHONATUS CARPENTER

BY J. R. LE B. TOMLIN

In 1902, in his "Synopsis of the Family *Veneridæ*,"[4] Dall wrote that this species had never been collected since it was described from the Vancouver region.[5]

As a matter of fact, Carpenter says: "Hab.: ? Vancouver, ? Japan (Mrs. Cuming). The shell was sent me as from Dr. Forbes' Vancouver collections and is so quoted in the British Association Report for 1863, p. 607, but Mr. Cuming subsequently stated his belief that it came from Japan."

Mr. Cuming's belief was perfectly correct. Whilst overhauling the *Veneridæ* in the British Museum recently I came across the specimen described by Carpenter, its identity being established by pencilling both on the back of the tablet and on the inner side of the valves of the shell. It is in poor condition and somewhat imperfect, but recognizable at a glance as *Macrocallista chishimana* Pilsbry.[6]

[1] Cummins, W. F., *Fourth Ann. Rept., Pt. 1, Geol. Survey*, 1892 [1893], pp. 181-190.

[2] See Gordon, *U. S. Geol. Survey, Water Supply Paper*, 317, 1913, pp. 30-31, 58-59.

[3] See "A Pleistocene Molluscan Fauna from Phillips County, Kansas," *Univ. Kansas Sci. Bull.*, Vol. VII, No. 3, 1913, in which a similar southward extension of land snails is discussed by Hanna & Johnston.

[4] *Pr. U. S. Nat. Mus.*, xxvi, 408.

[5] *Pr. Z. S. 1865*, 203.

[6] *Pr. Ac. N. Sc. Philada. 1905*, p. 118.

SOME SLUGS FROM MEXICO

BY T. D. A. COCKERELL,
University of Colorado.

I am indebted to Dr. Paul Bartsch for permission to examine some slugs which were recently sent to the National Museum by Dr. A. L. Herrera, Director de Estudios Biologicos, Mexico City.

LIMAX FLAVUS Linnaeus.

City of Mexico; numerous specimens of this European species, which is new to Mexico. The specimens belong to the common form in which the dark markings are dark grey or black. This is the variety *colubrinus* Pini, 1876, originally described from Esino in Lombardy, and said to be yellow, the mantle and back broadly and irregularly maculate with black, the black and yellow about equal in amount. Pini considered this different from var. *maculatus* Moquin-Tandon, which he also found at Esino, for whereas the pale areas of *colubrinus* are yellow (colorless in alcohol), those of *maculatus* are brown or brownish. The latter variety has been beautifully figured in colors by Taylor,[1] and as the name given by Moquin-Tandon is preoccupied, it has been renamed *nigromaculatus* Cockerell.[2] As a matter of fact these differences are unimportant, and Taylor classes both forms as phases or subvarieties of var. *umbrosus* Philippi, 1844.

The term *Limax maculatus* seems first to have been used by Nunneley in Trans. Phil. and Lit. Soc. Leeds, vol. 1 (1837), p. 46. Taylor, singularly enough, cites this in the synonymy of both *Limax maximus* and *L. flavus*. I am indebted to Dr. Bartsch for a copy of Nunneley's description, which indicates a slug "of a reddish brown color, with four longitudinal stripes of black, more or less continuous down the body. . . . The shield is irregularly spotted with black." This agrees

[1] Monograph, *Land and Fresh Water Mollusca British Isles*, part 11 (1905), pl. x, f. 9.

[2] *Science Gossip*, 1893, p. 25.

with Taylor's figure of *L. maximus* var. *tigris* Adams ms., Taylor, which must be called *L. maximus* var. *maculatus* (Nunneley). This has priority over var. *maculatus* Picard, 1840, which is a different form. Picard's slug is identical with var. *cellarius*, but this name cannot be credited to d'Argenville, who published before 1758.

Agriolimax species.

Desierto de los Leones, one specimen in formalin, collected by Dr. Herrera. About 11 mm. long as preserved, very dark plumbeous, without markings; sole whitish, with the lateral areas pale grey. Jaw with a very strongly developed central projection, as in *A. laevis* (Müller). Median teeth with short ectocones, agreeing with Strebel's figure of *A. berendti* Strebel. Inner laterals tricuspid, with ectocone distinct but endocone forming a right angle with base of mesocone, and in the outer laterals becoming obsolete. Marginals with a thornlike outer process or ectocone, recalling *A. pallidus* Schrenk, as figured by Lessona and Pollonera.

It is impossible to describe this slug from the material before me, but fresh and abundant material may show it to be a new species, the marginal teeth being apparently distinctive. The color agrees with Crosse and Fischer's *A. guatemalensis*, "caeruleonigricans, discus [sole] pallidus," but the teeth do not agree. It is quite possible that the slug is *A. stenurus* Strebel, described from East Mexico, and generally placed in the synonymy of *A. laevis*. Certainly, however, it is not *laevis*.

ON THE FRESHWATER SHELLS OF MONROE, CONNECTICUT.

BY ARTHUR P. JACOT

The present paper is a companion to the report on the land shells of this region published in the Nautilus in April, 1919 (vol. 32, no. 4). The town of Monroe is divided into two drainage areas by a major ridge running from southeast to northwest. Monroe center is situated on the crest of this

ridge. On the northeast slope is the Boy's Half Way and the Half Way Rivers (brooks), both of which drain directly into the Housatonic River. The former is poor in shells and fish while the latter is considerably richer. The drainage on the southwest slope is larger and forms part of much longer streams which also drain into the Housatonic River or Long Island Sound. This section was not carefully studied.

The five stations at which collections were made are (1) Cargyle's Pond, a small, artificial, water-lily pond on the Boy's Half Way; (2) the brook running into the pond about 200 yards above the pond, on shallow sandy riffles (few or no shells were found below the pond); (3) one of the ends of a branch of the Half Way, a small, clear, woodland brook; (4) an upland swamp described in the former article; (5) that part of the Housatonic River forming part of the town line. Many of the collections in the river were made about Zoar Bridge. This locality, however, has been entirely wiped out and conditions entirely changed by the construction of a large dam one mile below the bridge, flooding the country back for some ten miles. The conditions below this dam, as at Otter Rock, are still the same. Less than a mile below Otter Rock are the head waters of another flooded area caused by the dam at Shelton. Thus are our wild, swift rivers being changed into expanses of quiet water and certain types of habitat becoming more and more difficult of access.

The Sphaeriidæ have very kindly been identified by V. Sterki. Grateful acknowledgment is also due C. W. Johnson for encouragement and advice.

Strophitus edentulus (Say). Uncommon at 5 in deep, quiet water.

Strophitus undulatus (Say). Data lost.

Anodonta cataracta Say. Uncommon at 5 in deep, quiet water.

Alasmidonta undulata (Say). Fairly common at 5 in shallow water, among stones.

Alasmidonta marginata (Say). Fairly common at 5 in deep, quiet water.

Unio complanatus (Dillwyn). At 5 and in streams southwest of center.

Sphaerium sulcatum (Lam.). Farmhill River and tributaries (southwest of center).

Sphaerium "somewhat like *striatinum*," undescribed. Fairly common at 5 in sand rift, behind large boulders in swift, shallow water where bed is covered with stone and rocks. Also reported from Maine by Sterki.

Musculium partumeium (Say). Uncommon, probably at 1.

Musculium securis (Prime). Common at 1.

Pisidium abditum Haldeman (2 forms). Common at 3, some in sand rifts, some in mud or silt rifts.

Pisidium acquilaterale (Prime). Common at 1, occasional at 2.

Pisidium "somewhat like *fallax* Sterki". In company with *Sphœrium* (not *striatinum*).

Pisidium griscolum Sterki. Rare at 2.

Pisidium monas Sterki "apparently". Rare at 3.

Pisidium occidentale Prime. A few young in a marshy pool at head of Cargyle's Pond.

Pisidium punctatum Sterki. Rare at 3 in mud rifts.

Pisidium punctatum simplex Sterki. Rare at 2 in sandy rifts.

Pisidium streatori Sterki. Common at 4.

Pisidium subrotundum Sterki. Uncommon, in company with *P. occidentale*.

Pisidium variabile Prime. Uncommon at 1 and a smaller form at 2. This latter with a much larger quantity of *P. acquilaterale* were found distending the stomach of two or three Bullheads or Catfish (*Ameiurus nebulosus* Le Sueur) taken from the pond.

Amnicola limosa (Say). Common at 5, on *Potamogeton* in quiet water, also at 1.

Lyogyrus pupoidea (Gould). Locality uncertain.

Physo heterostropha (Say). Several at 5, eroded at tip.

Physa ancillaria Say. Large and fine at 5 on *Potamogeton* in swift water, also at 3 on weed culms.

Aplexa hypnorum (Linné). Fairly common at 4, but small.

Pseudosuccinea columella (Say). Occasional at 1.

Pseudosuccinea columella chalybea (Gould). Rare in marshy pool at head of Cargyle's Pond.

Galba obrussa (Say). Occasional at 5.

Planorbis antrosus Conrad. Common at 1, also at 2, on weeds under road bridge.

Planorbis (*Menetus*) *exacuous* Say. Occasional at 4.

Planorbis (*Gyraulus*) *deflectus* Say. Common at 5 on *Potamogeton* preferably where there is a slight current.

Segmentina armigera (Say). Rare at 4.

Ancylus fuscus C. B. Adams. Common at 1.
Ancylus rivularis Say. Abundant at 5, on *Potamogeton*, preferably where there is current, strong or weak.

Careful search was made for *Pomatiopsis lapidaria* (Say) along the Housatonic to its mouth but none were found.

A NEW DEEP WATER LYONSIELLA

BY W. H. DALL

LYONSIELLA MAGNIFICA n. sp.

Shell large, thin, pearly, subquadrate, equivalve, very inequilateral, beaks low and small, prosocoelous; posterior end produced, rounded, posterior slope somewhat convexly arched; anterior slope rapidly descending, abruptly rounded; basal margin nearly straight; hinge edentulous, the internal ligament long, narrow, parallel with the hinge line; outer surface polished under a pale olive periostracum, with an almost microscopic sculpture of radial rows of very minute pustules; the radii are equal, equally distributed, and average three or four to a millimeter, when measured transversely. Length of shell, 25; anterior end beyond the vertical from the beaks, 4; height, 17; diameter, 14 mm. U. S. Nat. Mus. Cat. No. 266802.

Off Cape San Lucas, Lower California, in 63 fathoms, mud and gravel; U. S. Str. Albatross, Dr. Paul Bartsch directing collections.

This is probably the largest species of the genus.

THE STATUS OF TEREDO BEACHI AND TEREDO NAVALIS

BY PAUL BARTSCH

I have so far refrained from commenting on the efforts of Professor Kofoid and his students to discredit the validity of my *Teredo beachi*. A review in the NAUTILUS for April, 1923, on page 140, of Robert Cunningham Miller's paper on the "Variations in the Shell of Teredo Navalis in San Francisco Bay," University of California Publications in Zoology, vol. 22, no. 2, pp. 293-328, bears the following statement,

which is a slightly abbreviated rendition of Miller's statement on page 25 (317): "The local varieties, including *T. beachi* Bartsch, have not been found sufficiently differentiated to warrant their being classed as subspecies, much less as species."

This, I feel, makes it necessary for me to protest lest my silence be construed as concurrence in the opinion of my West Coast critics.

The paper in question is a beautiful intensive study of *Teredo beachi* Bartsch, and barring the summary, in which the systematic status of this species is discussed, a splendid piece of work. It is unfortunate that the author in question, as well as Professor Kofoid himself, has not made an equally intensive study of the European *Teredo navalis*, which I have been unable to find in American waters, before publishing this summary, for I am certain that had they so done, they themselves would have become acquainted with the characters that differentiate the *navalis* group from the *Teredo morsei* group, to which *Teredo beachi* belongs.

In *Teredo navalis*, the denticles on the anterior median area have but a single cusp. In the *Teredo morsei* group, they are multicuspid. That at once differentiates the two groups, and there are hosts of other characters that separate the members of these groups into specific or subspecific elements.

The only member of the *navalis* group that I have found so far in American waters is the New England shipworm, *Teredo novangliae* Bartsch. All the other true *Teredos* seen belong to the *morsei* group, both on the East and the West Coast of America.

BERMUDA SHELLS

BY E. G. VANATTA

Early in 1922 Mr. Hiram Hoyt collected samples of leaf-mould on four islands not mentioned in my paper on Bermuda Shells in the Proceedings of the Academy of Natural

Sciences of Philadelphia, 1910, pages 664-672. The following species of land shells were picked from this material:

St. David's Island

Helicella ventricosa Drap.
Eulota similaris Fér.
Polygyra plana Dkr.
Thysanophora selenina Gld.
Gastrocopta rupicola Say
Gastrocopta p. hordeacella Pils.
Obeliscus swiftianus Pfr.
Rumina decollata L.
Poecilozonites bermudensis Pfr.
Zonitoides minuscula Binn.
Milax (shell only)
Succinea barbadensis Guild.
Carychium bermudensis Gul.
Helicina convexa Pfr.

Paget Island

Helicella ventricosa Drap.
Eulota similaris Fér.
Polygyra plana Dkr.
Thysanophora hypolepta Shutt.
Gastrocopta rupicola Say
Gastrocopta p. hordeacella Pils.
Zonitoides minuscula Binn.
Milax (shell only)
Succinea barbadensis Guild.
Helicina convexa Pfr.

Cooper's Island

Helicella ventricosa Drap.
Eulota similaris Fér.
Polygyra plana Dkr.
Thysanophora selenina Gld.
Thysanophora hypolepta Shutt.
Gastrocopta rupicola Say
Gastrocopta p. hordeacella Pils.
Zonitoides minuscula Binn.
Carychium bermudensis Gul.
Helicina convexa Pfr.

Ireland Island

Helicella ventricosa Drap.
Eulota similaris Fér.
Polygyra plana Dkr.
Gastrocopta rupicola Say
Gastrocopta barbadensis Pfr.
Gastrocopta p. hordeacella Pils.
Rumina decollata L.
Zonitoides minuscula Binn.

NOTES.

Note on Fenella, Obtortio and Alabina.—Hedley in 1899 proposed for *Rissoa pyrrhacme* Melvill and Standen, which he supposed to belong to *Fenella* A. Adams (a preoccupied name) the genus *Obtortio* and gave an excellent figure of the shell and its nucleus, the latter marked by strong axial rib-

bing. An examination of specimens of Adams' typical species (from Japan) received from him many years ago, shows that it and the Californian species have a nucleus beginning smooth and later developing spiral sculpture. The difference is sufficient to separate the two groups of which the Japanese and Californian species will continue to bear the name *Alabina* (Dall, 1902).—Wm. H. Dall.

Introduced Species of Lymnæa in Southern California. —I have taken *Lymnæa columella* Say and *Lymnæa auricularia* (Linne) from a pond in Exposition Park, Los Angeles, also from a park at Beverly Hills, Cal. Mr. Allen, a local dealer in aquatic plants and goldfish, states that the latter occurs in a number of aquaria and ornamental ponds in this vicinity. They have doubtless been introduced and distributed with lily bulbs. Mr. Allen informs me that *L. auricularia* occurred in his ponds about three years ago and has been a common occupant since. These two species first came to my notice over a year ago. To my knowledge they have not been previously reported from the western states. — Wendell O. Gregg, M.D.

We regret to record the death of Frederic William Harmer, which occurred April 11, 1923. He was in his 88th year. Mr. Harmer was the author of the monograph on the Pliocene Mollusca of Great Britain, published by the Palaeontographical Society, the last part appearing in 1919.

Correction.—In the last issue of The Nautilus, page 137, the following should be inserted:—Fewkes, J. Walter. 1889. New Invertebrata from the Coast of California, pp. 45-46. Printed for the author. Boston. The citation referred to Fewkes should read:—McFarland, F. M.

Nomenclature of Certain Species of Chrysodomus and Calliostoma. — For over twenty years I have been using spare time in making a card catalogue of every name that I could find which has been applied to any shell from the West

Coast of both Americas, using all literature accessible. I have added references to all articles containing figures or descriptive matter which could be used in the diagnosis of these shells, with localities; also references to all local lists of shells which extended the known range. Thanks to the enormous synonymy, which has led to interminable cross references, the number of cards has reached about 12,000 and there is still much to be done.

During my oriental trip from 1913 to 1915 nothing was done, and since my return, bad eyes have prevented me from prosecuting the work. For a few months I have been at it again with renewed zest. A duplication of names and a duplicate description of the same shell which I have recently found seems to need correction.

In the Proc. Nat. Mus., Vol. 14, 1891, p. 188, Dr. Dall describes *Chrysodomus* (*Sipho*) *hypolispus* n. sp., from near Bering Island in 45 fathoms. This species appears in his Bulletin of the Nat. Mus. 112, p. 96, as *Colus* (*Latisipho*) *hypolispus* Dall, 1891. In the Proc. Nat. Mus. for 1920 (issued in 1919), Vol. 56, p. 324, again appears *Chrysodomus hypolispus* n. sp., evidently a different shell, taken by the Albatross in the Japan Sea in 325 fathoms. As I can find no new name proposed for this shell, I propose that it be called *Chrysodomus kelseyi*, new name.

In the Bulletin of the Southern California Academy of Sciences, Vol. 14, No. 8, p. 118, 1905, Mrs. Williamson describes *Calliostoma canaliculatum parvum* n. var. This is our common form of *C. canaliculatum* Martyn, the typical form being rather rare about San Diego. In the Proc. Nat. Mus. for 1920 (issued in 1919), Vol. 56, p. 360, Dr. Dall gives a brief description of the same variety, basing his description on typical specimens from San Diego, under the name *Calliostoma canaliculatum*, new variety *nebulosum*, which name must pass into synonymy.

I wish to add that I would be pleased if my catalogue could be made useful to anyone working on West Coast shells, and I will be glad to furnish data to anyone desiring them.

Fred Baker.

Point Loma, Cal., Oct. 10, 1922.

THE TYPE OF PLOTIA 'BOLTEN'. — *Plotia*, of the *Museum Boltenianum*, compiled by P. F. Roeding, p. 95, was one of those happy inspirations which should rejoice the hearts of the revivers of Bolten. It contained species referable to the genera *Melanoides*, *Faunus*, *Liguus*, *Pyramidella*, *Dorsanum*, and several *nomina nuda*. Brot in 1874 mentioned *Melania spinulosa* Lam. as type, but this species was not in Bolton's (Roeding's) list. In order to get rid of the name in the nomenclature of melanians (*Thiaridæ*), we here designate *Plotia lineata* the type.—H. A. PILSBRY and J. BEQUAERT.

Dr. Pilsbry sailed from Vancouver, June 29, for Australia, as a delegate representing the Academy of Natural Sciences at the Second Conference of the Pan-Pacific Scientific Congress, to meet in Melbourne and Sydney, August 13 to Sept. 3.

PLANORBIS IMMUNIS n. n.—In 1918 (Memorias do Instituto Oswaldo Cruz, X, p. 70) I described a new species from Rio de Janeiro, Brazil, as *Planorbis confusus*. I have since learned that that name had already been used by Rochebrune in 1881 for a Chinese species. I would therefore change the name of the Brazilian species to *Planorbis immunis*. — DR. ADOLPHO LUTZ.

To celebrate the eighty-fifth birthday of Professor Edward S. Morse, some twenty members of the Boston Malacological Club visited him at the Peabody Museum in Salem on June the 18th, to congratulate him and wish him years of useful work in the future. The visitors were headed by the President of the Club, Mr. Arthur F. Gray, who at an appropriate moment presented Professor Morse with a silver pitcher and tray suitably inscribed, giving at the same time a brief review of some of Professor Morse's work begun in 1856. It was a most enjoyable day for all present.

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PARTIAL LIST OF THE MOLLUSCAN FAUNA OF CATALINA ISLAND

BY A. M. STRONG

Early in July, 1921, during a week of very low tides, the writer made a collecting trip to the Isthmus, Catalina Island, California, in company with Mr. C. E. White of Los Angeles. The result was very satisfactory and the trip was repeated again the following year with equally good results. A number of rare shells were collected as well as some which have not been previously reported from this district, and several hundred specimens secured of an *Odostomia* which proved to be undescribed.

Catilina is one of a chain of islands off the coast of southern California. It lies about 20 miles from the mainland and is included in Los Angeles County. The island, about 21 miles long and 8 miles wide at the widest place, has all the appearance of the summit of a sunken mountain range, and it is commonly considered that at one time it was part of the Coast Range of Central California. Except where the canyons meet the sea, forming coves, with short beaches, the entire island is mountainous. The drop in the ocean floor is nearly as abrupt as that of the land, in some places a depth of 600 feet being reached within half a mile of shore. There are no sand beaches on the island; most of the shore line is sheer rock. At a few places there are bluffs with broken rock

at their foot; and at the back of the coves, many of which on the lee side of the island are well protected, the short stretches of beach are composed of shingle or small pebbles.

At the Isthmus conditions are a little different from those on the balance of the island. Here Catalina Harbor on the ocean side is an almost landlocked bay a mile or more in depth by half a mile in width, while exactly opposite it Isthmus Cove cuts deeply into the coast line on the land side. The two are separated by a gentle roll of land a half a mile in width. The topography is the same as occurs at a low saddle or pass in a mountain range. Both bays are comparatively shallow and have a considerable protected shore line. While there is no sand beach there are some small areas of mud flats and flat lying reefs of loose rock.

Collecting conditions were ideal. Mine host Gregg of the Isthmus Camp, ably seconded by Mrs. Gregg, furnished us with a comfortable tent-house and boat and equipment, coupled with genuine old-time California cooking and no complaint at irregular hours. Collecting was done in several different ways. The extreme low tides occurring very early in the morning, daylight found us on the rock reefs. After a late breakfast the balance of the morning was spent dredging the bays or examining the kelp fields lying just off the points. The afternoons were usually spent working along the loose rock reefs where there were a few small tide-pools. We found that most of the bottom of the bays was covered with a thick growth of moss, making dredging impossible. However, a few small patches of clear sandy mud were located, and these were alive with small shells. While the number of species found in these patches was not very large, some few rare shells were obtained and numbers of specimens of four species seldom seen on the main land. The kelp beds were not very productive, only three species being secured from them. The best collecting was found among the loose rocks on the reefs along the bay shores. During our stay a number of abalones were speared for us in from 10 to 15 feet of water. These were taken home and all the moss and other growth carefully scraped off them. After drying this moss it was carefully examined for small shells. From the abalones

secured this year the moss yielded over 600 specimens of some 30 species. A number of these were not found under any other conditions.

Our collecting was mainly confined to the more rare species and those not commonly found on the mainland. At the same time we tried to keep a record of everything seen among the more common shells and so have as complete a record as possible of the molluscan fauna of that particular locality. The accompanying list is by no means complete; no dredging was done in over 20 feet of water, and it is known that many other species are to be found in the deeper water off the island. The limited time spent on the work, less than two weeks in all, would make it extremely unlikely that the full list of the shore species was obtained. However it is believed that the list is fairly representative of the fauna. The two bays are separated by sixteen miles of shore line and one is on the exposed side of the island while the other is protected from all but occasional storms. A number of species were found only in one bay or the other. The principal reason for this seemed to be different conditions along the limited extent of shore line worked over, and no attempt was made to keep separate lists for the two bays.

The majority of the species on the list were collected or were collectable in large numbers. A few, particularly among the dredged material, were represented by one or two specimens only and in a few other cases dead shells on the beach or picked up by Mrs. Gregg after storms were all that were seen. No attempt was made to secure quantitative results. Many mollusks live in colonies or travel in schools. The finding of a few strays would seem to indicate the presence of limited numbers only, while collecting at some different season or the examination of some overlooked point nearby would show them present in large numbers. To secure quantitative results of any value requires detailed collecting extended over a long period of time. The most noticable difference between collecting at the Isthmus and at similar places on the mainland was the scarcity of limpets and chitons, both in number of species and in number of individuals, the apparent absence of *Acanthina*, and the wealth of material among the smaller species.

The principal value of lists such as this one lies in the information to be secured for the study of the distribution of the fauna by comparison with similar lists from other localities. In the NAUTILUS, Vol. 31, page 103, Mr. E. P. Chace gives a list of nearly 100 species that were collected at Anaheim Bay, a point on the mainland some 30 miles from the Isthmus. Comparing the two lists shows but 24 species which are on both. In the Anaheim Bay list, shells inhabiting sandy shores and muddy bays predominate while our Catalina list those inhabiting rocky coasts. Packard in his Molluscan Fauna from San Francisco Bay (Univ. of Cal., Pub. in Zoology, Vol. 14, No. 2) lists 194 species and varieties from San Francisco Bay, the Farallone Islands and dredged between the Islands and the mainland. This list contains 34 species which are on the Anaheim Bay list and 24 species that we found at Catalina. Only 10 species are common to all three lists. The comparison would seem to indicate a closer relation of the mainland fauna at Anaheim Bay to the more northern fauna at San Francisco than is the case with the island fauna at Catalina.

Another and probably better method of comparing faunas from different localities is by means of the prevailing direction of the known ranges. The Catalina list may be divided as follows; 20 species, or 12 per cent of a limited local known range; 43 species or 28 per cent, with an approximately equal range to the north and to the south; 26 species, or 17 per cent, whose range to the north by latitude is twice or more than that to the south; 66 species, or 43 per cent, whose range to the south by latitude is twice or more than that to the north. The Anaheim Bay list shows 3 per cent local, 32 per cent of equal range, 23 per cent with a northern range, and 41 per cent with a southern range. The San Francisco list has 13 per cent local or with uncertain range, 19 per cent with equal range, 40 per cent with a northern range, and 28 per cent with a southern range. This comparison shows the Catalina and Anahein Bay lists to be equally southern in their characteristics, while the San Francisco list is distinctly northern.

The list of species and varieties collected, 155 in all, follows:

Solemya (Petrasma) panamensis Dall *a*
Philobrya setosa Cpr. *a*
Ostrea palmula Cpr. *a*
Pecten (Plagioctenium) circularis aequisulcatus Cpr.
Hinnites giganteus Gray
Lima (Mantellum) dehiscens Conr.
Mytilus californianus Conr.
Mytilus adamsianus Dunker.
Mytilus multiformis Cpr. *a*
Modiolus (Gregariella) opifex Say *a*
Septifer bifurcatus Rve.
Crenella decussata Montagu. *a*
Lyonsia gouldi Dall *a*
Cardita subquadrata Cpr.
Milneri kelseyi Dall
Chama pellucida Sby.
Diplodonta orbella Gould
Phacoides (Callucina) californica Conr.
Phacoides (Parvilucina) tenuisculpta Cpr. *a*
Lasaea rubra Mont. *a*
Cardium (Fragum) biangulatum Sby.
Cardium (Laevicardium) substriatum Conr.
Transennella tantilla Gould *a*
Pitaria newcombiana Gabb
Chione succincta Val.
Psephidia lordi Baird *a*
Psephidia salmonea Cpr. *a*
Cooperella subdiaphana Cpr.
Tellina (Angulus) carpenteri Dall *a*
Tellina (Oudardia) buttoni Dall *a*
Semele pacifica, Dall *a*
Cumingia lamellosa Sby.
Psammobia californicus Conr.
Tagelus californianus Conr.
Cryptomya californica Conr.
Acteocina culcitella Gld. *a*
Bullaria gouldiana Pils.
Haminaea virescens Sby.
Pleurobranchus digneti Roch.
Gadina reticulata Sby.
Conus californicus Hinds
Mangilia pulchrior Dall *a*
Mangilia tersa Dall *a*
Cytharella merita Hinds *a*
? Daphnella fuscoligata Dall *a*
Olivella biplicata Sby.
Marginella regularis Cpr. *a*
Marginella (Hyalina) californica Tomlin
Cystiscus politulus Dall *a*
Merovia pyriformis Cpr. *a*
Strigatella (Atrimitra) idæ Melvill
Strigatella (Atrimitra) catalinae Dall
Mitromorphia filosa Cpr.
Fusinus kobelti Dall
Fusinus luteopictus Dall
Macron lividus A. Adams
Alectrion (Schizopyga) perpinguis Hinds
Alectrion (Schizopyga) mendica Gould
Alectrion (Schizopyga) cooperi Forbes
Anachis penicillata Cpr. *a*

Columbella (Alia) carinata Hinds
Columbella (Alia) hypodra Dall *a*
Amphissa versicolor Dall *a*
Murex (Triremis) gemma Sby.
Purpura nuttallii Conr.
Tritonalia circumtexta Stearns
Tritonalia interfossa Cpr.
Tritonalia gracillima Stearns *a*
Tritonalia foveolata Hinds
Epitonium (Opalia) crenimarginata Dall
Epitonium (Nitidoscala) tinctum Cpr.
Ianthina exigua Lamarck
Pyramidella (Longchaeus) adamsi Cpr.
Turbonilla (Chemnitzia) kelseyi Bartsch *b*
Turbonilla (Mormula) pentalopha D. & B. *b*
Odostomia (Chrysallida) helga D. & B. *b*
Odostomia (Chrysallida) pulcia D. & B. *b*
Odostomia (Chrysallida) catalinensis Bartsch *b*
Odostomia (Chrysallida) clementina D. & B. *b*
Odostomia (Chrysallida) cincta Cpr. *b*
Odostomia (Ividella) pedroana D. & B. *b*
Odostomia (Ividella) navisa D. & B. *b*
Odostomia (Miralda) aepynota D. & B. *b*
Odostomia (Evalina) americana D. & B. *b*
Odostomia (Evalea) tenuisculpta Cpr. *b*
Odostomia (Evalea) phanella D. & B. *b*
Odostomia (Evalea) strongi Bartsch *b*
Odostomia (Amaura) subturrita D. & B.
Cypraea spadicea Swains.
Trivia solandri Gray
Erato columbella Mke.
Trifora pedroana Bartsch *b*
Selia montereyensis Bartsch *b*
Cerithiopsis (Cerithiopsidella) antefilosa Bartsch *b*
Cerithiopsis (Cerithiopsis) oxys Bartsch *b*
Bittium (Lirobittium) interfossa Cpr. *b*
Bittium (Lirobittium) attenuatum Cpr. *b*
Bursa californica Hinds
Caecum dalli Bartsch *b*
Caecum californicum Dall *b*
Fartulum orcutti Dall *b*
Aletes squamigerus Cpr.
Petaloconchus montereyensis Dall *a*
Vermiculum anellum Morch *a*
Spiroglyphus lituellus Morch *a*
Littorina planaxis Pil.
Littorina (Melaraphe) scutulata Gould
Lacuna unifasciata Cpr. *a*
Lacuna marmorata Dall *a*
Iselica fenestrata Cpr. *a*

Diala marmorea Cpr. *a*
Barleeia subtenuis Cpr. *a*
Barleeia haliotiphila Cpr. *b*
Barleeia californica Bartsch *b*
Alvania aequisculpta Keep *b*
Alvania cosmia Bartsch *b*
Amphithalamus inclusus Cpr. *b*
Rissoina kelseyi D. & B. *b*
Rissoina dalli Bartsch *b*
Syncera translucens Cpr. *b*
Truncatella stimpsoni Stearns *a*
Capulus californicus Dall *a*
Hipponix antiquatus Linn
Hipponix tumens Cpr.
Crepidula onyx Sby.
Crepidula (Crepipatella) lingulata Gld.
Crepidula (Ianicus) nummerius Gld.
Polinices (Neverita) recluziana alta Dall *a*
Acmaea limatula Morch
Acmaea scabra Gld.
Acmaea paleacea Gld.
Phasianella pulloidea Cpr. *a*
Phasianella (Eulithidum) typicum Dall *a*
Astraea (Pomaulax) undosus Wood
Leptothyra carpenteri Pils.
Leptothyra bacula Cpr.
Liotia fenestrata Cpr. *a*
Liotia acuticostata Cpr. *a*
Norrissia norrisii Sby.
Tegula (Chlorostoma) gallina Fbs.
Tegula (Chlorostoma) gallina umbilicatum Dall *a*
Tegula (Omphalius) aurotinctus Fbs.
Tegula (Omphalius) ligulatus Mke.
Calliostoma splendens Cpr.
Margarites (Lirularia) parcipicta Cpr. *a*
Haliotis cracherodii Leach
Haliotis fulgens Phil.
Haliotis corrugata Gray
Fissurella volcana Rve.
Fissurella volcana crucifera Dall
Megathura crenulata Sby.
Megatebennus bimaculatus Dall
Cyanoplax hartwegii Cpr. *c*
Ischnochiton (Lepidozona) pectinulatus Cpr. *c*
Ischnochiton (Lepidozona) asthenes Berry *c*
Acanthochitona avicula Cpr. *c*

a Specimens identified by Dr. Wm. H. Dall.
b Specimens identified by Dr. Paul Bartsch.
c Specimens identified by Dr. S. Stillman Berry.

F. C. MEUSCHEN IN THE ZOOPHYLACIUM GRONOVIANUM

Explanatory Note

BY WILLIAM HEALEY DALL

The work of Gronovius[1] although published long after the introduction of the Linnean system of nomenclature, had no specific names, merely diagnoses of species under named genera, consisting of a few lines of description. After the death of the author the last fascicule of the work was edited by Meuschen who supplied a list of specific names in the Linnean sense, as stated in the preface by Boddaert, arranged alphabetically and referring to Gronovius' species by their serial numbers. If one wants to find the Meuschenian name for a particular diagnosis one has to go over the entire list until the serial number catches the eye, as the names are alphabetically arranged and the serial numbers not arranged at all.

On account of this inconvenience and of the inaccessibility of the work for the average student it seemed worth while to list the names, many of which are earlier than those of Gmelin (1791–2), so that preoccupied specific names might be eliminated without the labor now required.

It should be noted that there are many misprints in the Meuschen index, some omissions, and several incorrect spellings; the latter are herein indicated by cross references. Most names identical with those proposed by Linnaeus in the 10th and 12th editions of the Systema Naturae are here omitted, and with few exceptions only the new names proposed by Meuschen and taking date of 1781 are catalogued. Much confusion has been caused by assigning an erroneously early date for the part of Gmelin's edition of the *Systema* which contains the mollusks. This cannot date earlier than 1791, and it is not impossible that a large part of it was not published until 1792. One not

[1] Zoophylacii / Gronoviani / fasciculus tertius / exhibens / Vermes / Mollusca, testacea / et Zoophyta. / Laur. Theodorus Gronovius; Lugduni Batavorum; fasc. III, Vermes testacea; folio, 1781, pp. 250–352, pl. XVIII–XIX; Index by Meuschen, 5 pages not numbered.

infrequently finds a name of Gmelin's referred to 1788, which is the date of publication of one of the earlier volumes of the series, but not of the volume containing the Testacea.

Some years ago after a hasty examination of a defective copy of this work, I ventured the opinion that it was not binomial in the Linnean sense and should only be quoted historically. A recent opportunity of consulting a copy of this extremely rare volume containing Meuschen's Index has convinced me that this conclusion was erroneous. The preface states that the index is prepared on the Linnean system. There are in a list of 280 species only seven trinomials, two of which are taken from Linnaeus, and of those under *Voluta* three which have the name *Mitra* intercalated, presumably in a subgeneric sense, as is done by Linnaeus in his tenth edition.[1]

I am therefore somewhat regretfully obliged to consider that the names in the index must be considered valid. Only one generic name, *Amphiperas*, is introduced, but a number of specific names in more or less common use will be affected. In the Museum Geversianum, 1787, Meuschen proposes a system of Molluscan classification which is distinctly his own and not Linnean, partly polynomial and the names put in the plural. The other groups, vertebrates and insects, were binominally treated.

His octavo Index of the Museum Gronovianum, 1778, I have not seen, but it is cited by Sherborn in the Index Animalium as containing new species, though rejected by most authors who have examined it.

BINOMIAL SPECIFIC NAMES APPLIED BY MEUSCHEN TO THE NAMELESS SPECIES OF GRONOVIUS' ZOOPHYLACIUM, 1781.

(Alphabetically Arranged.)

Species.	*Genus.*	*Serial No.*	*Page.*
achatina	(Helix)	1558	334
aculeatus	(Cardium)	1121	265
admiralis	(Conus)	1234	284
albida	(Venus)	1148	270
albumen	(Buccinum)	1377	308

[1] Cf. *Voluta Mitra episcopalis*, Syst. Nat. ed. X, p. 732, No. 363.

amaranthus	(Conus)	1245	286
ambigua	(Haliotis)	1599	341
ambiguus?	(Turbo)	1518	328
ambustus	(Murex)	1431	315
ammiralis	(Conus) see *admiralis*		
ammonoides	(Nautilus)	1220	282
ampullacea	(Bulla)	1295	294
ampullacea	(Helix)	1550	333
anatinus	(Mya)	1094	261
angulosa	(Venus)	1160	271
antiqua	(Patella)	1614	344
antiquata	(Patella)	1612	344
anus	(Murex)	1460	320
aporrhais	(Strombus)	1393	310
arausiaca	(Nerita)	1578	338
arausiaca flava	(Nerita)	1581	338
argonautaea	(Sepia)	1028	244
aruanus	(Murex)	1464	320
atra	(Nerita)	1596	340
auricularia	(Helix)	1551	333
Auris Judae	(Bulla)	1306	296
babilonicus	(Murex)	1459	319
babylonius	(Murex) see *babilonicus*		
bajet	(Ostrea)	1190	297
balaustina	(Tellina) see *balaustrina*		
balaustrina	(Tellina)	1112	363
barbadensis	(Patella)	1637	348
beccari	(Nautilus)	1218	282
beccarii	(Nautilus) see *beccari*		
bezoar	(Murex)	1447	318
bullatus	(Conus)	1247	286
cana	(Helix)	1557	334
cancrena	(Nerita)	1575	337
canrena	(Nerita) see *cancrena*		
canteriata	(Ostrea)	1196	277
capensis	(Patella)	1626	346
caperata	(Venus)	1140	268
capitaneus	(Conus)	1233	284
capitellum	(Murex)	1446	318
capucinus	(Voluta)	1329	300
caput-serpentis	(Turbo)	1510	327
caput-serpentis	(Nerita)	1587	339
carbunculus	(Murex)	1423	314
carocolla	(Helix)	1539	331
carocolla dentata	(Helix)	1537	331

carrosa	(Cypraea)	1281	291
casina	(Venus) see *cassina*		
cassina	(Venus)	1142	269
ceratus	(Conus)	1225	283
cetra	(Patella)	1618	345
cicatricosum	(Buccinum)	1350	303
cicatrix	(Cypraea)	1282	292
cinctus	(Murex)	1476	322
cipmannianus	(Conus)	1240	285
Chama granosa	(Venus)	1153	270
chione	(Venus)	1145	269
chionea	(Venus)	1144	269
clava	(Mytilus)	1207	279
clavula	(Patella)	1634	348
coerulescens	(Patella)	1633	348
convoluta	(Murex)	1462	320
cor	(Chama)	1168	273
corniculatus	(Murex)	1457	319
cornu damae	(Helix)	1543	332
cornutum	(Buccinum)	1341	302
cortex	(Amphiperas)	1293	293
cremor	(Tellina)	1113	263
crenulatum	(Buccinum)	1379	308
cuspidata	(Patella)	1621	345
cyclaminum	(Helix)	1545	332
cymbiu	(Voluta) see *cymbium*		
cymbium	(Voluta)	1335	301
cymbium	(Argonauta)	1215	281
cymbula noae	(Arca)	1170	273
delator	(Murex)	1440	317
depyga	(Venus)	1156	271
distortus	(Murex)	1441	317
dolaboratoides	(Trochus)	1501	326
dolabratus	(Helix)	1574	337
dolarium	(Murex)	1449	318
duplicatum	(Buccinum)	1383	308
edula	(Cardium)	1129	266
edule	(Cardium) see *edula*		
electrica	(Anomia) see *electrum*		
electrum	(Anomia)	1203	278
elephantinoides	(Dentalium)	1641	349
entalis	(Dentalium)	1642	349
ephippium	(Anomia)	1199	278
erpina	(Venus)	1143	269
erycina	(Venus) see *erpina*		

exuvia	(Nerita)	1594	340
faber	(Trochus)	1492	324
fabula	(Tellina)	1111	263
fasciata	(Helix)	1572	337
fasciata	(Ostrea)	1187	276
fasciatum	(Buccinum)	1357	304
fastus	(Voluta)	1312	297
fenestralis	(Venus)	1149	270
fimbria	(Tethys)	1016	242
flammeu	(Buccinum) see *flammeum*		
flammeum	(Buccinum)	1343	302
flammeum	(Buccinum)	1381	308
folliculum	(Bulla)	1307	296
forata	(Anomia)	1198	278
fornicarius	(Patella)	1604	342
frameum	(Buccinum)	1384	309
frondea	(Patella)	1610	344
fucata	(Tellina)	1106	262
fuscator	(Murex)	1480	322
fuscatus	(Murex)	1477	322
fusus	(Murex)	1458	319
gallopavus	(Strombus)	1413	313
gallulus	(Strombus)	1402	311
gari	(Venus)	1152	270
generalis	(Conus)	1231	284
gibber	(Nerita)	1586	339
gigantea	(Ostrea)	1194	277
gigantina	(Chama)	1164	272
gigas	(Ostrea)	1195	277
glabra	(Tellina)	1104	262
glaciale	(Buccinum)	1373	307
globulus	(Cypraea)	1288	292
granulatum	(Buccinum)	1388	309
granulatus	(Murex)	1478	322
granulatus	(Trochus)	1483	323
gyrus	(Trochus)	1487	323
haustor	(Murex)	1481	322
hecticu	(Buccinum) see *hecticum*		
hecticum	(Buccinum)	1380	308
histrix?	(Murex)	1445	317
hystrix	(Murex) see *histrix*		
ignomon	(Strombus)	1412	313
imperialis	(Conus)	1224	283
indigo	(Nerita)	1590	339
islandicus	(Murex)	1471	321

ispidula	(Voluta)	1310	297
jacobaea	(Ostrea)	1177	274
janthina	(Murex)	1452	319
jecusculum	(Helix)	1549	333
jubar	(Patella)	1630	347
laciniosa	(Patella) see *lacinosa*		
lacinosa	(Patella)	1628	347
lampadophora	(Helix)	1540	331
lanceatum?	(Buccinum)	1386	309
langula	(Patella)	1620	345
lateraria	(Patella)	1613	344
lentiginosiformis	(Strombus)	1399	311
leptocaryon	(Buccinum)	1375	307
lignarius	(Murex)	1465	320
lineata	(Helix)	1569	336
lineata	(Venus)	1161	271
lineata	(Voluta)	1325	299
litteratorius	(Conus)	1226	283
livida	(Voluta)	1313	297
lucorum	(Helix)	1554	334
luhuanus	(Strombus)	1400	311
lunicula	(Patella)	1631	347
lunulata	(Bulla)	1305	296
lutea	(Cypraea)	1275	291
lutea	(Nerita)	1585	339
maculatus	(Voluta)	1311	297
mammillana	(Nerita)	1580	338
marginatus	(Strombus)	1401	311
maxima	(Ostrea) see *maximus*		
maximus	(Ostrea)	1178	274
millepedarius	(Strombus)	1395	310
mitra	(Helix)	1564	335
Mitra cardinalis	(Voluta)	1327	299
Mitra episcopalis	(Voluta)	1328	300
Mitra papalis	(Voluta)	1330	300
monachus	(Conus)	1248	286
moneta	(Venus)	1157	271
morio	(Trochus)	1498	325
musculus	(Cypraea)	1276	291
mustelina	(Nerita)	1582	338
neriteu	(Buccinum) see *neriteum*		
neriteum	(Buccinum)	1360	305
niloticus	(Trochus)	1482	323
nodulus	(Helix)	1538	331
nucea	(Voluta)	1319	298

nucleus	(Ostrea)	1188	276
nyritodys	(Voluta)	1334	301
oculata	(Cypraea)	1271	290
Oculus capri?	(Helix)	1544	332
Oculus caprimulgi	(Helix)	1548	333
oleariu	(Buccinum) see *olearium*		
olearium	(Buccinum)	1337	301
olearius?	(Turbo)	1513	327
oliva	(Helix)	1546	333
oliva	(Nerita)	1588	339
oliva	(Voluta)	1309	296
os roseum	(Helix)	1573	337
os rubrum	(Helix)	1547	333
pagona	(Venus)	1159	271
pallida	(Bulla)	1301	295
palma	(Conus)	1237	285
palmea	(Bulla)	1304	296
palustris	(Trochus)	1500	325
patullum	(Buccinum)	1363	305
patulum	(Buccinum) see *patullum*		
pectinata	(Patella)	1615	344
pensylvania	(Venus)	1155	271
pensylvanica	(Venus) see *pensylvania*		
perspectiviunculus	(Trochus)	1486	323
perspeculatus	(Trochus)	1485	323
perversibiliformis	(Murex)	1472	321
perversibilis	(Murex)	1473	321
perversus	(Murex)	1468	321
physis	(Bulla)	1298	295
pileare	(Murex)	1438	316
pisum	(Cypraea)	1287	292
plana	(Mya)	1090	260
polita	(Nerita)	1597	340
porphyria	(Voluta)	1308	296
praemorsum	(Buccinum) see *praerosum*		
praerosum	(Buccinum)	1370	307
priamus	(Helix)	1561	335
pugilis	(Strombus)	1404	311
purpureus	(Mytilus)	1208	279
pyra	(Trochus)	1496	325
pyrum	(Voluta)	1318	298
radiata	(Tellina) see *radicata*		
radicata	(Tellina)	1109	263
radula	(Ostrea)	1185	276
rameus	(Murex)	1429	315

ramulosus	(Murex)	1425	315
ranula	(Murex)	1437	316
rapacia	(Murex)	1454	319
remier	(Tellina)	1114	264
remies	(Tellina) see *remier*		
rogata	(Cardium)	1125	266
rostrata	(Helix)	1565	336
ruber	(Conus)	1230	284
rustica	(Patella)	1623	346
rusticulum	(Buccinum)	1367	306
saccharinoidea	(Patella)	1632	347
sanguinea	(Ostrea)	1183	275
scansorius	(Conus)	1238	285
scapha	(Arca)	1173	274
scaphaciuncula	(Arca)	1174	274
scobinata	(Anomia)	1202	278
scortum	(Donax) see *scrotum*		
scrotum	(Donax)	1133	267
scrobilator	(Murex)	1434	316
solaris	(Trochus)	1488	323
spathula	(Patella)	1605	342
spinosum	(Buccinum)	1344	302
spirilloides	(Murex)	1456	319
spirillus	(Murex)	1455	319
spondyloidea	(Ostrea)	1189	276
spurius	(Conus)	1239	285
squamosa	(Venus)	1154	270
stimulus	(Trochus)	1497	325
striatum	(Buccinum)	1345	302
striatum	(Buccinum)	1385	309
strigatum	(Buccinum)	1387	309
strigilatum	(Buccinum)	1382	208
striosa	(Tellina)	1108	263
subulatum	(Buccinum)	1378	308
surgeonella	(Patella)	1639	349
syrmatophora	(Mya)	1093	260
tabacea	(Anomia)	1201	278
tigerina	(Tellina)	1115	264
tigris	(Cypraea)	1252	287
trogiloides	(Cypraea)	1262	288
tuber	(Trochus) see *faber*		
tuberosum	(Buccinum)	1349	303
tumulosa	(Cypraea)	1259	288
turris	(Buccinum)	1390	309
umbilicata	(Helix)	1541	331

unicolor	(Conus)	1229	284
urceolus	(Strombus)	1417	313
varia	(Ostrea)	1182	275
vatan	(Ostrea)	1191	277
verrucosa	(Cypraea)	1279	291
versura	(Venus)	1150	270
vespertilio	(Voluta)	1332	300
virginea	(Nerita)	1591	339
virgineu	(Buccinum) see *virgineum*		
virgineum	(Buccinum)	1369	307
vitellus	(Nerita)	1583	338
vivisicata	(Helix)	1571	337
ziczaciuncula	(Cypraea)	1263	289
zonaria	(Helix)	1556	334

THE MARINE SHELLS OF SANIBEL, FLORIDA

BY WILLIAM J. CLENCH

Late in the summer of 1921, a trip was undertaken to Sanibel Island, Florida, for the purpose of collecting mollusks. Arriving there the second week in August, collecting was carried on until the middle of September.

This cresent-shaped island is located on the west coast of Florida, about 130 miles north of Key West and two miles from the mouth of the Caloosahatchee River. It is sixteen miles long and five miles wide near the center. The eastern end of the island runs out to a narrow point, at the extremity of which is located the Sanibel light-house. The north-west portion is somewhat broader and is separated from Captiva Island to the north by a shallow strait known as Blind Pass.

Mollusks were found along the entire beach fronting on the Gulf and were especially abundant near the light-house, where the sand bars were much wider and longer. Collections were also made at Clam Bayou, a small shallow bay opening into Blind Pass, and at Tarpon Bay, a large bay on the north side of the island. Tarpon Bay, with the exception of a narrow outlet, is surrounded by a mangrove swamp, and all species listed as from Tarpon Bay include this swamp area, as well.

Many shells formerly common on Sanibel have disappeared, while others have become quite rare. The abundance of shells on the island, especially the larger and more showy species, attracts many tourist-collectors during the winter season, for the purpose of collecting. This might in part explain the paucity of many of these forms that were abundant a few years ago. It is quite probable that the shifting of many sand bars and the destruction of portions of the beach by wave action which has taken place in the last few years has also aided in decreasing the shell fauna. Examples of this are *Oliva sayana* and *Strombus pugilis*, at one time very common but now found but occasionally.

There were many species, however, which were very abundant along the entire beach, such as *Terebra dislocata* and *Donax variabilis*. The former was the most common of all the beach species and at low tide the exposed bars were covered with a network of their irregular tracks, the animals themselves being partially buried in the sand. The *Donax* was found in patches eight to ten feet wide, the location of which could easily be determined from a distance by the groups of shore birds feeding upon them. Dead specimens of *Cardium robustum* were found in abundance along high-water mark, and occasional living specimens on the outer sand bars.

In the vicinity of Tarpon Bay, *Litorina angulifera* was very common on the roots and lower branches of the mangrove. *Melampus bulloides* and *M. coffeus gundlachi* were collected in the thickets bordering the bay, and in the bay proper *Cerithium minimum* with the two varieties *nigrescens* and *septemstriatum* were usually found on exposed sand flats and in all shallow water, especially on submerged palmetto logs. *Busycon perversus* and *Melongena corona* occurred on both the beach and bay sides of the island, the beach forms being lightly marked and heavy, the bay forms usually covered with marine growths and of a lighter weight. Large clusters of the "coon" oyster, *Ostrea virginica*, covered the air roots of the mangrove trees and the wharf pilings. These "tree oysters" as they are sometimes called, presented a striking appearance at low tide when they were exposed to view.

Following is a list of the marine mollusks collected on the Island. I am indebted to Mr. C. W. Johnson and Mr. W. F. Clapp who have kindly aided me in identifying the material.

Tarpon Bay

Ostrea virginica Gmel. On mangrove roots, wharf pilings.
Plicatula gibbosa Dall. Rare.
Pecten gibbus irridians Lam. Not common.
Parastarte triquetra Conr. Valves only. Dredged in sand.
Codakia orbiculata Mont. Rare. Single valves only.
Anomalocardia cuneimeris Conr. Valves only. Sand and mud.
Transennela stimpsoni Dall. One single valve.
Cyrena floridana Conr. Many single valves.
Phacoides floridana Conr. Common. Sand.
Tellina tampaensis Conr. Common.
Macoma constricta Conr. Rare. Sand and mud.
Lyonsia floridana Conr. Rare.
Actaeon punctostriatus C. B. Ad. Common, sand.
Tornatina canaliculata Say. Dead, sand and mud.
Melampus coffeus gundlachi Pfr. Common, grass and thickets about bay.
Melampus bulloides Mont. Rare, found with M. gundlachi.
Mangilia stellata Stearns. Common, sand and mud.
Olivella mutica Say. Common, sand.
Marginella apicina Menke. Rather common, sand.
Fasciolaria tulipa Linn. Rare, sand flats.
Fasciolaria distans Lam. Common, sand flats.
Busycon perversus Linn. Common, sand flats. (Also found on Gulf side).
Busycon pyrum Dill. Rare. Sand flats.
Melongena corona Gmel. Sand flats. (Also on Gulf side).
Alectrion vibex Say. Sand and mud, common.
Muricidea floridana Conr. Dead, sand and mud. Rare.
? Pyramidula producta C. B. Ad. Rare. Sand.
? Pyramidula fusca C. B. Ad. Rare, sand and mud.
Bittium varium Pfr. Common, sand and mud.
Cerithium muscarum Say. Common, sand flats.
Cerithium minimum Gmel. Common, sand flats.
Cerithium minimum nigrescens Menke. Very abundant, sand flats.
Cerithium minimum septemstriatum Say. Common, sand flats.
Cerithidea scalariformis Say. Not common, mangrove swamp.
Cerithidea turrita Stearns. Common, sand flats.
Modulus flordianus Conr. Common, sand and mud.

Litorina angulifera Lam. Very common, on mangrove trees.
Crepidula glauca Say. Common, on sea-grass.

Beach

Anomia simplex d,Orb. Dead, common.
Pecten exasperatus Sowb. Dead, very common.
Pinna muricata Linn. Dead, high-water mark.
Pinna seminuda Lam. Dead, not common.
Mytilus exustus Linn. Not common, attached to king crabs.
Modiolus tulipus Lam. Only one specimen found at high-water line.
Arca ponderosa Say. Attached to sea-weed.
Arca floridana Conr. Not common, attached to sea-weed.
Arca occidentalis Phil. Rare, sand bars.
Cardita floridana Conr. Common.
Chama arcinella Linn. Rare, low-water.
Cardium robustum Sol. Common, sand bars at low-water.
Cardium isocardia Linn. Not common, low-water.
Liocardium serratum Linn. Few single valves at low-water.
Chione cancellata Linn. Dead, common along beach.
Macrocallista maculata Linn. Single valves only.
Macrocallista gigantea Linn. Rare, sand bars.
Dosinia elegans Conr. Common, along high-water line.
Donax variabilis Say. Very common, near low-water line.
Tellina lineata Turt. Rare, dead on beach.
Spisula solidissima similis Say. Common on sand bars.
Raeta canaliculata Say. Dead, common along high-water line.
Bullaria occidentalis C. B. Ad. Rare.
Terebra dislocata Say. Very common on sand bars.
Conus proteus Hwass. Rare, Low-water line.
Conus pealii Green. Dead, high-water line.
Conus floridanus Gabb. Dead, high-water line.
Cancellaria reticulata Linn. Not common, low-water line.
Oliva sayana Rve. Rare, sand bars.
Fasciolaria gigantea Kiener. Common, low-water line.
Canthus tinctus Conr. Dead, inhabited by hermit crabs.
Murex rufus Lam. Rare, low-water line.
Murex pomum Gmel. Not common, sand bars.
Epitonium angulatum Say. A single specimen at low-water line.
Pyrula papyratia Say. Dead, along high-water line.
Strombus pugilis Linn, Not common, sand bars.
Vermicularia spirata Phil. A few dead specimens near light-house.
Crepidula fornicata Linn. Common, on other shells, king crabs, etc.

Crepidula plana Say. In aperture of dead *Polinices duplicata* Say.
Natica canrena Lam. Rare, sand bars.
Polinices duplicata Say. Common on sand bars.
Sigaretus perspectivus Say. Not common, sand bars.
Turbo castaneus Gmel. Rare, low-water line.
Fissuridea alternata Say. Dead, low-water line.

Clam Bayou

Venus campechiensis Gmel. Common.
Barnea costata Linn. Not common, buried in sand and mud.

These two species were peculiar to this part of the island as far as I was able to ascertain. All other species that were found here were also found at Tarpon Bay. A single fragment of *Voluta junonia* Hwass. was found on the beach near this locality.

NOTES ON THE ANATOMY AND TAXONOMY OF CERTAIN LAMPSILINAE FROM THE GULF DRAINAGE

BY A. E. ORTMANN, PH. D.

1. Ptychobranchus greeni (Conrad) (1834); Ptychobranchus foremanianum (Lea) (1842); Ptychobranchus trinacrum (Lea) (1861).

Simpson (1914, pp. 336–338) gives these as separate species, but he unites (and rightly so) *woodwardianus* Lea (1857) and *velatus* Conrad (1853) with *foremanianus*, and *simplex* Lea (1845) and *flavescens* Lea (1845) with *greeni*.

The three species admitted by Simpson belong to the Alabama drainage, and the first (*greeni*) is reported from Black Warrior River, the two others from the Coosa River. Simpson points out the possible identity of *trinacrus* with *foremanianus*. He distinguishes *greeni* by being smaller and more delicate, and having a more nearly elliptical outline.

It is impossible for me to see in *trinacrus* anything but an individual variation of *foremanianus*, chiefly, since shells similar to this have never been found subsequently. The

characters given for *greeni* can be recognized in most cases, and, in addition, I should say that *greeni*, from the Black Warrior River, has the rays poorly developed, and has no blotches, while *foremanianum*, from the Coosa, has more distinct rays and blotches.

Specimens from Cahaba River approach *greeni* in shape and color markings, yet the latter are often more distinct, showing rays, but without forming blotches.

Thus there are two types of *Ptychobranchus* in the Alabama system, the one belonging to the Black Warrior and Cahaba, the other to the Coosa, but they are not sharply separated. Many Coosa specimens have poorly developed rays and no blotches; the shape is very variable, not always triangular; and, on the other hand, there are specimens in the Cahaba, and also in the Black Warrior, which have more distinct rays, and others which are smewhat triangular. Thus I think it is best to regard these forms as local varieties of the same species, which should bear the name: *Ptychobranchus greeni* (Conrad) (1834). The typical form is found in Black Warrior and Cahaba Rivers, while the variety, *Pt. greeni formanianum* (Lea) (1842) represents this in the Coosa River.[1]

Anatomy. Already Lea has described and figured the marsupium and glochidium of *U. woodwardianus* and *foremanianus*. The marsupium places these forms undoubtedly into the genus *Ptychobranchus* (see: Ortman, Ann. Carnegie Mus. 8, 1912, p. 308). I have material of the soft parts from the following localities.

Coosa River, Wilsonville, Shelby Co., Ala.—1 gravid female (without shell), H. H. Smith coll., Nov. 4, 1911.

Chatooga River, Cedar Bluff, Cherokee Co., Ala.—1 gravid female (without shell), H. H. Smith coll., Nov. 1910.

Black Warrior River, Walker Co., Ala.—6 gravid females (without shells), H. H. Smith coll., Oct. 15, 1912.

The first two localities undoubtedly represent the *foremani-*

[1] Ball (Ecology 3, 1922, p. 112) distinguishes, in the Black Warrior River, a third form: *Ptychobranchus greeni flavescens*, which apparently should be regarded as the compressed headwaters-form of *greeni*.

anum-type, the last typical *greeni*, since many *shells* are at hand from a number of localities in the various drainages, showing the shell-characters as described above. Glochidia were present in all soft parts, except one of *greeni*, and thus the breeding season apparently begins in autumn.

No unusual features are shown in the soft parts. It should be mentioned, however, that the inner lamina of the inner gills is, in one specimen, entirely connected with the abdominal sac, while in the others it is more or less free behind: the maximum is about one half of the length of the abdominal sac. The number of folds of the marsupium varies according to the size of the individual, from 8 to 12. I do not observe any dark pigment on the edge of the marsupium, but the material has been a long time in alcohol. The placentae are the usual shape and quite solid. Glochidium subovate, without hooks, higher than long, L. 0.15, H. 0.18 mm: thus they are somewhat smaller than those of *Pt. fasciolare* (Raf.).

The genus Medionidus in the Alabama drainage.

Medionidus conradicus (Lea) (1934), common in the headwaters of the Cumberland and Tennessee drainages (see: *M. plateolus* (Raf.) Ortman, Proc. Amer. Philos. Soc. 57, 1918, p. 575), has been reported also from the Alabama system, but according to my observations, this is incorrect. The genus is represented, there, indeed, but by different forms, which may be distinguished as follows.

a_1 Color rays not reticulated or spotted, but straight and continuous, the finer ones sometimes wavy. Corrugations of posterior slope rather fine. *M. conradicus*

a_2 Color rays reticulated or interrupted, spotted. Corrugations of posterior slope coarser.

- b_1 Rays poorly developed, forming, over the whole surface, a painting of a reticulated character. No distinct posterior ridge. Posterior end of shell not pointed. Nacre bluish. *M. parvulus*
- b_2 Rays better developed, rather broad, but also composed of reticulations, or interrupted. Posterior ridge distinct. Posterior end of shell pointed. Nacre often of reddish or salmon color. *M. acutissimus*

2. Medionidus parvulus (Lea) (1860).

Simpson, Descr. Cat. 1914, p. 248.

Type-locality: Coosa River, Ala., and "Chattanooga, Ga." (surely Chattooga River, Ga. is meant). Simpson adds: Swamp Creek, northwest Ga. (tributary to Conasauga River, in Whitfield Co., Ga.).

The Carnegie Museum possesses 15 specimens of this species. Exact localities are recorded for the following.

Cahaba River, Lily Shoals, Bibb Co., Ala.—5 spec., R. E. Call coll.

Coosa River, Weduska Shoals, Shelby Co., Ala.—1 spec., H. H. Smith coll.

Coosa River, near Upper Clear Creek, Talladega Co., Ala., H. H. Smith coll.—1 spec.

Coosa River, Riverside, St. Clair Co., Ala.—1 spec., H. H. Smith coll.

Choccolocco Creek, Jackson Shoals, Talladega Co., Ala.—1 spec., H. H. Smith coll.

Conasauga River, Conasauga, Polk Co., Tenn.—2 gravid females (with soft parts), A. E. Ortmann coll., May 24, 1915.

M. parvulus is a *M. conradicus* with the painting of a reticulate character, the rays not or poorly developed, and the corrugations of the posterior slope somewhat coarser. Lea (Obs. 11, 1867) has described the soft parts, and also the glochidium. According to him, the marsupium has 10 ovisacs, is located in the middle of the outer gill, occupying one third of its length. The inner gills are free from the abdominal sac over half of its length, and the posterior half of the mantle-margin is crenulated. The glochidium is "elongate pouch shaped".

According to my two females, the anatomy is practically identical with that of *M. conradicus* (Ann. Car. Mus. 8, 1912, p. 335; Naut. 28, 1915, p. 142; Naut. 34, 1921, p. 90). Inner lamina of inner gills connected with abdominal sac anteriorly for about half of its length. Papillae of mantle margin small, with exception of 1 or 2 anterior ones, which are remarkably long and subcylindrical. Marsupium larger or smaller, depending on size of shell, located near the middle of the gill, number of ovisacs up to 20. Color of soft parts the

same as in *M. conradicus* (blackish), of marsupium white, with no pigment on edge. Glochidium: L. 0.19, H. 0.25 mm., thus corresponding to the minimum measurements known in *conradicus*. Shape the same, subspatulate.

3. Medionidus acutissimus (Lea) (1831).

Simpson, 1914, p. 251. A synonym is *U. rubellinus* Lea (1857), which represents an old shell, while *acutissimus* is young.

The *type-locality* for *acutissimus* is the Alabama River, and it has been reported (by Conrad) also from Black Warrior River, Erie, Greene Co., Ala. (I was unable to locate a place of that name). *U. rubellinus* is from Othcalooga Creek, Gordon Co., Ga.

I have 16 specimens with the following exact localities.

Sipsey River, Texas, Marion Co., Ala.—3 spec., H. H. Smith coll.

Cahaba River, Gurnee, Shelby Co., Ala.—1 spec., H. H. Smith.

Coosa River, Weduska Shoals, Shelby Co., Ala.—2 spec., H. H. Smith coll.

Talladega Creek, Talladega Co., Ala.—4 specimens, Hartman collection.

Choccolocco Creek, Jackson Shoals, Talladega Co., Ala.—1 spec., H. H. Smith.

Chattooga Creek, Trion, Chatooga Co., Ga.—2 males, 1 gravid (discharging) female, (all with soft parts), A. E. Ortmann coll., May 19, 1915.

(*To be continued*)

A KEY TO THE FAMILY TEREBRIDAE *

BY PAUL BARTSCH

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In working up the Terebridae of the Mazatlantic faunal area, it was found desirable to subject the entire family to a critical examination, and the large collections in the United States National Museum have furnished some rather interesting infor-

mation. Believing that the superspecific data obtained will prove of use to students of this family, I have cast these in the form of a key.

Two genera are recognized in the present synopsis: namely, *Terebra*, which is characterized by the possession of a single columellar fold or twist and *Myurella*, in which two folds are present. The rest of the names may be considered as subgenera.

It is interesting to find that all the names heretofore proposed have a status in this new arrangement excepting *Impages* E. A. Smith, which is not considered sufficiently distinct from *Hastula* H. & A. Adams to merit retention.

Columella with one fold . . . . . TEREBRA
  Subsutural groove absent.
    Summit of the whorls appressed.
      Axis pervious . . . . . Mazatlania
      Axis not pervious.
        Shell nodulose . . . . . Spineoterebra
        Shell not nodulose. . . . . Hastula
    Summit of the whorls not appressed.
      Summit of the whorls narrowly shouldered.
        Whorls nodulose . . . . . Fusoterebra
        Whorls not nodulose . . . . . Acuminea
  Subsutural groove present.
    Spiral sculpture consisting of subsutural groove only.
      Axial ribs present on all whorls.
        Axial ribs strong.
          Subsutural groove cutting both ribs and intercostal spaces . . . . . Diplomeriza
          Subsutural groove cutting intercostal spaces only . . . . . Punctoterebra
        Axial ribs reduced to mere nodules . . . . . Noditerebra
      Axial ribs not present on all the whorls.
        Axial ribs present on early whorls only.
          Subsutural groove present on all whorls.
            Shell subulate . . . . . Subula
            Shell not subulate.
              Shell of Cerithoid form. . . . . Abretiella
          Subsutural groove not present on all whorls.
            Subsutural groove present on early whorl only . . . . . Oxymeris

Spiral sculpture not consisting of subsutural groove only.
Spiral sculpture consisting of subsutural groove and other grooves.
Spiral sculpture present on all whorls.
Axial ribs present on all whorls . . . . . Strioterebra
Axial ribs not present on all whorls.
Axial ribs present on early whorls only.
Subsutural cord nodulose on all whorls. . . . . Triplostephoma
Subsutural cord nodulose on early whorls only.
Spiral lines punctate . . . . . Terebrina
Spiral lines not punctate. . . . Perirhoe
Spiral sculpture absent on the later whorls . . . . Terebra
Columella with two folds . . . . . MYURELLA
Spiral sculpture consisting of subsutural groove only.
Axial ribs strongly developed on all whorls . . . . . Myurellisca
Axial ribs not strongly developed on all whorls.
Axial ribs evanescent on the later turns . . . . . Myurellina
Spiral sculpture consisting of subsutural groove and spiral striations . . . . . Myurella

Considerable time was required running down references to names and verifying type designations. To save future students of this task a chronologically arranged list of names supplying this information is here appended.

1799 *Terebra* (Bruguiere) Lamarck, Prodome, p.171. Type *Terebra subulata* Linne.

1817 *Subula* Schumacher, Ess. Nouv. Syst., p. 233. Type *Terebra dimidiata* Linne.

1844 *Myurella* Hinds, Sowerby's Thes. Conch., pp. 170, 171. Type *Terebra myuros* Lamarck.

1853 *Hastula* H. & A. Adams, Gen. Rec. Moll., vol. 1, p. 225. Type *Terebra strigillata* Lamarck + *Impages* E. A. Smith, 1873, Ann. Mag. Nat. Hist., ser. 4, vol. 11, p. 263. Type *Terebra coerulescens* Lamarck.

1891 *Strioterebrum* Sacco, Moll. Piemonte Liguria, p. 33. Type *Terebra basteroti* Nyst.

1891 *Spineoterebra* Sacco, Moll. Piemonte Liguria, p. 58. Type *Terebra spinulosa* Doderlein.

1891 *Fusoterebra* Sacco, Moll. Piemonte Liguria, p. 59. Type *Fusus terebrina* Bonelli.

1896 *Noditerebra* Cossmann, Ess. Pal. Comp., pp. 47, 51, pl. 4, f. 21. Type *Terebra geniculata* Tate.

1900 *Mazatlania* Dall, Nautilus, vol. 14, p. 44 = *Euryta* H. & A. Adams, 1853, Gen. Rec. Moll., p. 225, not *Euryta* Gistel, 1848, Naturg. Thier., p. 8. Type *Terebra aciculata* Lamarck.

1903 *Oxomeris* Dall, Proc. U. S. Nat. Mus., vol. 26, p. 951 = *Acus* Gray, 1847, Proc. Zool. Soc. London, p. 139, not *Acus* Edwards, 1771, in M. Catesby Carol. II, p. 30. Type *Terebra maculata* Lamarck.

1908 *Perirhoe* Dall, Nautilus, vol. 21, pp. 124, 125. Type *Terebra circumcincta* Deshayes.

1908 *Triplostephanus* Dall, Nautilus, vol. 21, pp. 124, 125. Type *Terebra triseriata* Gray.

1908 *Acuminea* Dall, Nautilus, vol. 21, pp. 124, 125. Type *Terebra lanceata* Linne.

1919 *Diplomeriza* Dall, Nautilus, vol. 33, p. 32 = *Duplicaria* Dall, 1908, Nautilus, vol. 21, pp. 124, 125, not *Duplicaria* Rafinesque, 1833, Atlantic Journ., p. 165. Type *Terebra duplicata* Lamarck as now restricted.

Names here proposed:

Abretiella Dall, new name = *Abretia* H. & A. Adams, 1853, Gen. Rec. Moll., vol. 1, p. 235, not *Abretia* Rafinesque, 1814, Spec. Sci. Giorn. Encic. Scicili, p. 154. This name has been applied to this subgenus in Dr. Dall's manuscript on the Mollusks of Hawaii and should be credited to him.

Terebrina new subgenus. Type *Terebra* (*Terebrina*) *cingulifera* Lamarck.

Punctoterebra new subgenus. Type *Terebra* (*Punctoterebra*) *nitida* Hinds.

Myurellisca new subgenus. Type *Terebra* (*Myurellisca*) *duplicatoides* Bartsch, described below.

Myurellina new subgenus. Type *Myurella* (*Myurellina*) *ornata* Gray.

MYURELLA (MYURELLISCA) DUPLICATOIDES new species.

= *Terebra duplicata* of authors in part.

Shell moderately large, chestnut brown, with a light peripheral zone and a light acute basal fasciole. Nuclear whorls decollated in all our specimens. Postnuclear whorls flattened, narrowly shouldered at the summit, marked by rather strong, very regular axial ribs, of which twelve occur upon the third, fourteen upon the fourth to sixth, sixteen upon the seventh to ninth, eighteen upon the tenth to twelfth, twenty upon the thirteenth, twenty-two upon the fourteenth, twenty-four upon the fifteenth to seventeenth, twenty-six upon the eighteenth and twenty-eight upon the last whorl. The whorls are cut by a deep sulcus about one-third of the distance between the summit and suture, anterior to the summit which not only divides the ribs at this point, but also cuts into the substance of the shell in the intercostal spaces, and forms a false suture. Periphery of the last whorl rounded. Base short, rounded, marked by the continuations of the axial ribs, which extend to the strong, acute and slightly reflected basal fasciole. The portion anterior to the basal fasciole is marked by strong lines of growth. Aperture elongate ovate, decidedly channeled anteriorily; posterior angle acute; outer lip thin; inner lip forming a slight callus, which is appressed to the columella and extends on the parietal wall. In a sectioned specimen the columella is found to have a strong anterior fold and a little less strong posterior fold.

The type, Cat. No. 348285, U. S. N. M., comes from Ceylon. It has lost the nucleus and probably the first postnuclear whorls. The eighteen whorls remaining measure: length, 55.3 mm.; diameter, 10.8 mm.

This is the dark-colored *Terebra duplicata* of authors subsequent to Linne. The parallelism in external sculpture of this and *Terebra duplicata* Linne has caused it to be misidentified in the past. On sectioning it is found that all the dark-colored forms have the biplicate columella, while *duplicata* has only a single fold.

LAND SHELLS FROM FLORIDA

BY E. G. VANATTA

The following species of land shells were picked from leaf-mould collected in seven counties in Florida.

I wish to thank the four gentlemen, whose names are mentioned in connection with the stations listed below, for presenting the material to the Academy of Natural Sciences of Philadelphia.

One specimen of *Pupoides modicus* (Gld.), which with 6 whorls has the great length of 5.3 mm., was found on La Costa Island. Although Mr. Moore sent several lots from this island, collected at various times, only this one large specimen was found, the remainder being of the usual size.

The list from "The Devils Mill Hopper," a sink hole about 8 miles from Gainesville, is based upon material collected upon several visits to the spot made by Messrs. Clark and Van Hyning. The *Gastrocopta pentodon* (Say) found there have the extra parietal lamella as figured in the NAUTILUS, Vol. XIX, pl. 7, fig. 32, and the *Gastrocopta contracta peninsularis* Pils. have the inward continuation of the parietal lamella "detached" as mentioned in the Manual of Conchology, Vol. 24, page 24. This and *Carychium exiguum* (Say) were very numerous in the leafmould.

The *Cerion incanum* (Binn.) from Sugar-loaf Key, collected by Mr. Clark, are all small like typical *C. incanum*, however they have the shape of var. *saccharimeta* Bl.

St. Augustine, Ancient Cemetery, St. Johns Co., collected by Mr. James B. Clark.

Gastrocopta rupicola (Say).
Gastrocopta pellucida hordeacella (Pils.).
Pupoides modicus (Gld).
Pupisoma minus (Pils.).
Zonitoides minuscula (Binn.).

The Devils Mill Hopper, eight miles from Gainesville, Alachua County, collected by Mr. James B. Clark and Mr. T. Van Hyning.

Gastrocopta pentodon (Say).
Gastrocopta contracta peninsularis Pils.
Gastrocopta corticaria (Say).
Vertigo ovata Say.
Vertigo oscariana St.
Vertigo milium Gld.
Pupisoma dioscoricola (Ad.)
Pupisoma minus Pils.
Strobilops strebeli aenea Pils.
Strobilops floridana Pils.
Strobilops hubbardi Br.
Polita indentata (Say).
Polita dalliana ('Simps' Pils.).
Striatura milium (Mrse).
Guppya sterkii (Dall).
Euconulus chersinus (Say).
Zonitoides arborea (Say).
Zonitoides minuscula Binn.
Agriolimax campestris (Bn.). Shell only.
Helicodiscus parallelus (Say).
Succinea avara Say.
Carychium exiguum Say.

Little Gasparilla Island, De Soto Co., collected by Mr. Clarence B. Moore.

Truncatella caibæensis succinea Ad.
Truncatella bilabiata Pfr.
Succinea floridana Pils.

Clearwater Key, Pinellas Co., collected by Mr. J. B. Clark.

Truncatella caribæensis 'Sby.' Rve.
Truncatella c. succinea Ad.
Truncatella bilabiata Pfr.
Polygyra cereolus (Muhl.).
Polygyra cereolus carpenteriana (Bld.).

Near Clearwater, Pinellas Co., collected by Mr. J. B. Clark.

Oligyra orbiculata Say.
Praticolella jejuna (Say).
Polygyra pustula (Fér.).
Polita indentata (Say).
Zonitoides arborea (Say).
Zonitoides minuscula (Bn.).
Succinea campestris Say.

Pinellas Park, Pinellas Co., collected by Mr. J. B. Clark.

Polygyra c. carpenteriana (Bld.).
Polygyra uvulifera (Shutt.).
Zonitoides arborea (Say).

Safety Harbor, N. W. part of Old Tampa Bay, Pinellas Co., collected by Mr. J. B. Clark.

Oligyra orbiculata Say.
Polygyra c. carpenteriana (Bld.).
Polygyra pustula (Fér.).
Zonitoides arborea (Say).

Near St. Petersburg, Pinellas Co., collected by Mr. J. B. Clark.

Oligyra orbiculata Say.
Truncatella caribæensis 'Sby.' Rve.
Truncatella c. succinea Ad.
Truncatella bilabiata Pfr.
Polygyra c. carpenteriana (Bld.).
Polygyra pustula (Fér.).
Gastrocopta pentodon (Say).
Gastrocopta c. peninsularis Pils.
Gastrocopta p. hordeacella (Pils.).
Gastrocopta rupicola (Say).
Strobilops floridana Pils.

Euglandina rosea (Fér.).
Polita indentata (Say).
Polita dalliana ('Simps.' Pils.)
Guppya gundlachi (Pfr.).
Guppya sterkii (Dall).
Zonitoides arborea (Say).
Zonitoides minuscula (Binn.).
Zonitoides singleyana (Pils.).

Ballast Point, Hilsborough Co., collected by Mr. J. B. Clark.

Oligyra orbiculata Say.
Praticolella jejuna (Say).
Polygyra c. carpenteriana (Bld.).
Polygyra uvulifera (Shutt.).
Gastrocopta c. peninsularis Pils.
Gastrocopta rupicola (Say).
Strobilops s. aenea Pils.
Euglandina rosea (Fér.).

Indian Hill, Hillsborough Co., collected by Mr. Clarence B. Moore.

Oligyra orbiculata Say.
Gastrocopta c. peninsularis Pils.
Gastrocopta p. hordeacella (Pils.).
Gastrocopta rupicola (Say).
Guppya gundlachi (Pfr.).
Zonitoides minuscula (Binn.).

North end of Captiva Island, Lee Co., collected by Mr. C. B. Moore.

Truncatella c. succinea Ad.
Truncatella bilabiata Pfr.
Thysanophora plagioptycha (Shutt.).
Pupoides modicus (Gld.).
Gastrocopta rupicola (Say).
Gastrocopta p. hordeacella (Pils.).
Pupisoma dioscoricola (Ad.).
Polita dalliana ('Simps.' Pils.)
Zonitoides minuscula (Binn.).
Zonitoides singleyana (Pils.).

Dog Key, Lee Co., collected by Mr. C. B. Moore.

Polygyra c. carpenteriana (Bld.).
Gastrocopta rupicola (Say).
Gastrocopta p. hordeacella (Pils.).
Guppya gundlachi (Pfr.).
Zonitoides minuscula (Binn.).
Zonitoides singleyana (Pils.).

Estero Island, Lee Co., collected by Mr. Clarence B. Moore.

Polygyra c. carpenteriana (Bld.).
Pupoides modicus (Gld.).
Gastrocopta rupicola (Say).
Guppya gundlachi (Pfr.).
Zonitoides minuscula (Binn.).
Zonitoides singleyana (Pils.).

Goodland Point, Lee Co., collected by Mr. Clarence B. Moore.

Pupoides modicus (Gld.).
Gastrocopta rupicola (Say).
Gastrocopta p. hordeacella (Pils.).

Gopher Key near Big Hickory Pass, Lee Co., collected by Mr. C. B. Moore.

Truncatella caribæensis 'Sby.' Rve.
Polygyra c. carpenteriana (Bld.).
Gastrocopta rupicola (Say).
Gastrocopta p. hordeacella (Pils.).

Horr's Island, Lee Co., collected by Mr. C. B. Moore.

Oligyra orbiculata Say.
Praticolella jejuna (Say).
Drymaeus multilineatus (Say).
Zonitoides minuscula (Binn.).

South end of La Costa Island, Lee Co., collected by Mr. C. B. Moore.

Truncatella c. succinea Ad.
Truncatella bilabiata Pfr.
Polygyra c. carpenteriana (Bld.)
Pupoides modicus (Gld.).
Gastrocopta rupicola (Say).
Gastrocopta p. hordeacella (Pils.).
Strobilops hubbardi (Brown).
Polita dalliana ('Simps.' (Pils.).
Guppya gundlachi (Pfr.).
Zonitoides minuscula alachuana (Dall.).

La Parita, Black Island, Lee Co., collected by Mr. C. B. Moore.

Truncatella caribæensis 'Sby.' Rve.
Truncatella bilabiata Pfr.
Polygyra c. carpenteriana (Bld.).
Pupoides modicus (Gld.).
Gastrocopta rupicola (Say).
Gastrocopta p. hordeacella (Pils.).
Vertigo milium Gld.
Guppya gundlachi (Pfr.)

Mondonga Island, Lee Co., collected by Mr. Clarence B. Moore.

Truncatella caribæensis 'Sby.' Rve.
Truncatella bilabiata Pfr.
Thysanophora plagioptycha (Shutt.).
Polygyra c. carpenteriana (Bld.).
Polygyra pustula (Fér.).
Pupoides modicus (Gld.).
Gastrocopta c. peninsularis Pils.
Gastrocopta pentodon (Say).
Gastrocopta rupicola (Say).
Gastrocopta p. hordeacella (Pils.).
Polita dalliana ('Simps.' Pils.).
Zonitoides minuscula (Binn.).

Starvation Key, Lee Co., collected by Mr. C. B. Moore.

Truncatella caribæensis 'Sby.' Rve.
Truncatella c. succinea Ad.
Truncatella bilabiata Pfr.

Polygyra septemvolva volvoxis (Pfr.).
Gastrocopta rupicola (Say).
Gastrocopta p. hordeacella (Pils.).
Zonitoides singleyana (Pils.).

House Hammock, Monroe Co., collected by Mr. C. B. Moore.

Oligyra orbiculata Say.
Polygyra c. carpenteriana (Bld.).
Thysanophora sclenina (Gld.).
Thysanophora plagioptycha (Shutt.).
Gastrocopta rupicola Say.
Guppya gundlachi (Pfr.).
Zonitoides arborea (Say).
Zonitoides m. alachuana (Dall).

Key West, Monroe Co., collected by Mr. J. B. Clark.

Drymacus multilineatus (Say).

Little Hammock, Monroe Co., collected by Mr. C. B. Moore

Oligyra orbiculata Say.
Thysanophora plagioptycha (Shutt.).
Gastrocopta c. peninsularis Pils.
Gastrocopta rupicola (Say).
Pupisoma dioscoricola (Ad.).
Euconulus chersinus (Say).
Guppya gundlachi (Pfr.).
Zonitoides arborea (Say).
Zonitoides minuscula (Binn.).

West end of Long Island, near Snake Creek, Monroe Co., collected by Mr. Morgan Hebard.

Chandropoma dentatum (Say).
Oligyra orbiculata Say.
Lucidella tantila (Pils.).
Truncatella bilabiata Pfr.
Thysanophora sclenina (Gld.)
Thysanophora inaguensis (Weinl.).
Thysanophora plagioptycha (Shutt.).
Pupisoma dioscoricola (Ad.).
Varicella gracillima floridana Pils.
Polita dalliana ('Simps.' Pils.).
Guppya gundlachi (Pfr.).

Sugar-loaf Key, Monroe Co., collected by Mr. J. B. Clark.

Cerion incanum (Binn.) near var. *saccharimeta* (Bl.).
Succinea floridana Pils.

NOTES

Lima hughi new name. My attention has been called to the fact that *Lima* (*Callolima*) *smithi* Bartsch, Proc. U. S. Nat. Mus., Vol. 45, 1913, pp. 236, 306, pls. 12, 13, which I there described from the Philippine Islands and named for Dr. Hugh M. Smith, is preoccupied by *Lima smithi* Sowerby, Proc. Zool. Soc. London, p. 207, pl. 11, f. 12, a Japanese species.

I take pleasure in bestowing Dr. Smith's first name, Hugh, upon the same shell with the same type. It may therefore be known as *Lima* (*Callolima*) *hughi.*—PAUL BARTSCH.

It is announced that a Civil list pension of £100 has been granted to Lieut.-Col. Henry Haversham Godwin-Austen "in recognition of his services to science and to the nation."

Col. Godwin-Austen, who resides at Nore, Godalming, on July 6th last completed his eighty-ninth year, and is now in his 90th. He comes of an old and well-known Surrey family, members of which were benefactors of the Guildford Royal Grammar School.

Col. Godwin-Austen himself has had an interesting career, some particulars of which have at different times appeared in the "Surrey Advertiser." It is seventy-two years since he was gazetted to the 24th Regiment of Foot, and he went to India in 1852, taking five months on the journey in a little barque of 590 tons.

The Colonel spent twenty-five years in India, and during the larger part of that time he was engaged in survey work, for which he was later awarded the Royal Geographical Society's founders medal. He did much mountaineering, and in one of his ascents, that of Rupshu, he reached a height of 20,600 feet. This peak in the Himalayas was afterwards named after him.

Col. Godwin-Austen devoted many years to an important work on "The Land and Freshwater Mollusca of India," and a few years ago the Asiatic Society of Bengal awarded him the Barclay memorial medal for his work on biology.

COURT RULES MUSSEL IS NOT A WILD ANIMAL. The fresh-water mussel of the Mississippi valley, from whose shell is manufactured pearl buttons, is the property of the owner of the land through which flow the non-navigable streams of its habitat, the Supreme Court held.

The controversy attracted wide attention because of its importance in the button industry, and brought into court such questions as whether the mussel was a "wild" animal. Justice Holmes, in deciding the case, said mussels should not be

classed with wild birds and fish which move beyond the jurisdiction of the owner of the land.

The lower court held that fishermen taking mussels from non-navigable streams could be prosecuted as trespassers, and the owner of the land through which the stream flowed could recover damages from whose who purchased shells from trespassers. This judgment was affirmed by the Supreme Court in principle.—*Boston Herald.*

PUBLICATIONS RECEIVED.

The Journal of Conchology, Vol. 17, No. 1, Jan. 1923. The Edible Molluses of British Isles, By E. W. Swanton. pp. 9-18. Mollusca from the Belgian Congo. (11) By G. C. Spence. pp. 19–24, and pp. 201–233.

No. 2. July, 1923.

Cochlicopa lubrica monst. sinistrorsum Westl. By J. W. Taylor. p. 33.

Patella depressa Pennant. By J. R. le B. Tomlin. p. 34.

Variation of Ena obscura. By W. E. Alkins. pp. 35–38.

Vitrina marcida Gould. By T. D. A. Cockerell. p. 39.

On South African Marine Mollusca with description of several new species. By J. R. le B. Tomlin. pp. 40–52.

Observations on the Land Mollusca of the coasts bordering on Bristol Channel. By J. Davy Dean. pp. 57–60.

An attempt to pair a dextral with a sinistral Limnaea pereger. By Lionel E. Adams. pp. 61–62.

Notes on British Mollusca. By Alan Gardiner. p. 63.

Proceedings of the Malacological Society of London. Vol. 25, March, 1923. On the Anatomical Characteristics of British Pisidia. By Nils Hj. Odhner. pp. 155-161, pl. 3.

Descriptions of twenty-one species of Turridæ from various localities, in the collection of Mr. E. R. Sykes. By James Cosmo Melvill. pp. 162-171, pls. 4 and 5.

On the date of publication of Charpentier's "Catalogue

des Mollusques Terrestres et Fluviatiles de la Suisse." By Prof. Dr. Jules Favre. p. 172.

Note on the capture of Spirula alive. Prepared by B. B. Woodward. p. 173.

Molluscan Life on the South Dogger Bank. By Guy C. Robson. pp. 174-178.

Notes on New Zealand Pelecypods. By W. R. B. Oliver. pp. 179-188.

An Index to "A Classification of the American Operculate Land Mollusks of the Family Annulariidæ." Compiled by Hugh C. Fulton. pp. 189-194.

List of British Nudibranchiate Mollusca. By Tom Iredale and Chas. H. O'Donoghue. pp. 195-200.

Vol. 25. June, 1923.

The Holocene non-Marine Mollusca of England. By A. S. Kennard. pp. 241–259.

Notes on the genus Stenochiton and the discovery and recognition of the type of Blainville's Chiton longicymba in Stenochiton juloides Adams and Angas. By Edwin Ashby. pp. 260–264.

Journal de Conchyliologie. Vol. 67, No. 3, Mar., 1923. Mitrides de la Nouvelle-Calédonie et de ses dépendances. Par Ph. Dantzenberg et L.-J. Bouge. pp. 179–259, pl. II.

Description d'un Eulimidé nouveau provenant de Lifon. Par Ph. Dantzenberg. p. 260.

De la durée de la vie chez l' *Helix spiriplana* Oliv. Par L. Vignal. p. 262.

The Glory of the Sea. By Roy Waldo Miner. Natural History, Vol. 22, pp. 325–328, 1923. A most interesting account of this rare shell—*Conus gloria-maris*, a specimen of which was recently obtained by the American Museum of Natural History, from Mr. Walter F. Webb. This specimen was formerly in the noted collection of the late Mrs. S. T. Williams of Chicago. There are only twelve or fourteen specimens of this species known, of which three, according to the writer, are in the United States.—C. W. J.

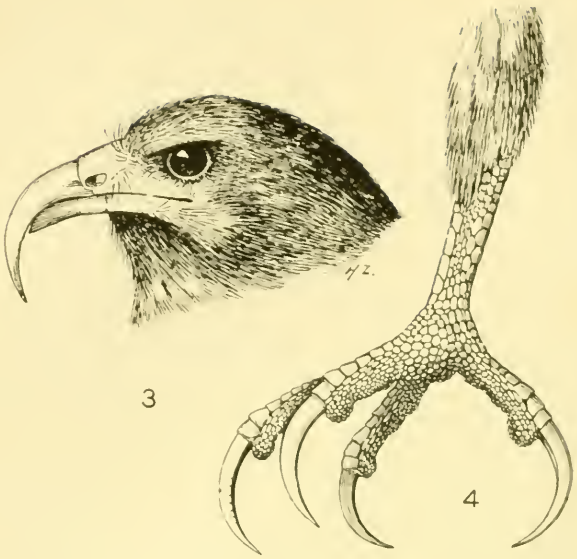

Fig. 3, *Rostrhamus sociabilis*. Head showing curved bill on which *Ampullarius* is spiked.
Fig. 4, Right foot. Both two-thirds natural size.

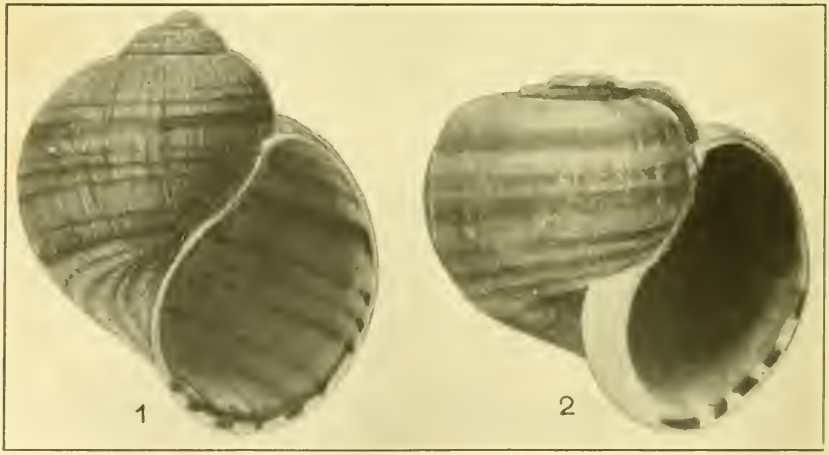

Fig. 1, *Ampullarius dolioides* (Reeve)
Fig. 2, *Ampullarius gevesensis* (Deshayes)

The Nautilus.

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AMPULLARIUS AND ROSTRHAMUS AT GEORGETOWN, BRITISH GUIANA

BY HERBERT LANG

When in Georgetown, British Guiana, I visited the densely crowded heron rookery in the Botanical Garden. It occupies an island in one of the many canals and is covered with a jungle about fifty feet high. Associated with the herons, chiefly of two species,—the little Blue Heron (*Florida cærulea*) and the Black-crowned Night Heron (*Nycticorax nævius*),—is a colony of about twenty Snail-hawks (*Rostrhamus sociabilis*), also known as Hook-bill Hawks or Everglade Kites. Herons and hawks are completely indifferent to each other. The hawks prefer the lofty outer branches, towering palms and larger trees nearby as perching sites while they feed on mollusks, a most interesting performance, as I had occasion to observe.

The Snail-hawk is rather graceful and slender, of dusky brown appearance, with fairly long wings and slightly emarginate tail. The peculiar, slender bill stands out conspicuously beyond the feathered portion of the relatively small head. The highly specialized upper bill forms a strongly arched, nearly semicircular hook, the cutting edges, generally sharp in birds of prey, being dull near the base and completely effaced toward the tip; a ridge running far forward on the palatal side of the bill adds considerably to its strength at the weakest point of the curve. Upon the long, downward bent, slightly blunt tip a

snail's body is easily impaled. No active part in the peculiar feeding process is taken by the rather weak mandible, though the gape is commensurately wide to accommodate easily such cumbersome, slimy food. The bare portion at the base of the bill includes the large cere, the anterior parts about the eye, and a strip along the mandible. These naked spaces about the bill undoubtedly save the feathers from being smeared with the slime that mollusks emit so profusely during their struggles. The bare condition of the lower portion of the feet and the lengthened, excessively acute claws are well adapted to catching hold of snails among the water-plants and firmly clutching the slippery, smooth shell. To believe that the Snail-hawk has to dig or pull these mollusks from the mud, as is generally stated, is probably incorrect. At least at Georgetown this is not the case.

As might be expected *Rostrhamus* is thoroughly acquainted with the habits of the snail which forms its favorite food. It has little difficulty in securing such prey and none whatever in removing the mollusk from its fragile shell, which is left absolutely intact. At Georgetown two species of *Ampullarius* are extremely common though only one serves as the principal, if not exclusive, food supply of the Snail-hawk.

There is not the slightest possibility of *Rostrhamus* inserting its bill between the operculum and the shell proper, nor is it probable that the hawk can pierce the brownish, horny operculum, which though thin and flexible is nevertheless extremely tough. All who have handled live *Ampullarius* know that at the slightest disturbance they withdraw quickly into their shell, securely closing the aperture with the operculum. Any further molestation, such as an attempt to pull out the operculum, causes them to emit a slimy fluid, from between the supple edges of the operculum and the nacreous inner wall of the shell. With the forcing out of this surplus slime, space is gained inside the shell allowing further contraction of the animal. Gradually the mollusk pulls the operculum so far inside as to be completely out of reach of even the hooked beak of the hawk. When the snail is thus fully withdrawn the pliable edges of the operculum turn slightly up and out on the narrower

tube establishing a closing edge several millimeters wide. Of course the elimination of slimy matter and forceful pulling inside of the operculum are also protective adaptations against other enemies than the Snail-hawk and moreover probably help meet such climatic conditions as continued drought.

Generally after being taken from its watery medium *Ampullarius* attempts to explore the surroundings, coming out of the shell and on dry ground crawling for about thirty feet. But from time to time the animal withdraws and having emitted all apparently available slime eventually shuts up tightly. Some of these snails I brought from British Guiana to New York in an ordinary cardboard box. By accident on board ship they were exposed for several days to the heat of a radiator and later in New York to the northern cold of March. Over thirty days they were thus out of water, yet a number of them survived. In their own habitat *Ampullarius* probably could withstand a drought of several months, a sufficient period in the tropics to tide them over into the rainy season should the swamps they inhabit dry out. When placed in an aquarium they excrete so excessive an amount of slime that the water becomes opaque and needs to be changed often.

A. dolioides Reeve* is brownish green, with globose spire and relatively small umbilicus. For breathing purposes it comes near or slightly above the surface and is then easily taken by *Rostrhamus*. *A. gevesensis* Deshayes* has numerous light brown, sometimes conspicuous bands and a more flattened spire. The umbilicus is relatively large, whereas the aperture in adults is smaller and more roundish than in the foregoing species. It lives in the mud, apparently without coming to the surface for air, which may be obtained through an extensible siphon. In any case it is not caught by the Snail-hawk, though extremely numerous in the canals right below the habitual perching trees of these birds. In fact in going over at least 2000 empty shells dropped by *Rostrhamus* we secured only two of *A. gevesensis*. And these might have been accidentally pro-

* The scientific names of the shells were kindly determined by Dr. H. A. Pilsbry, of the Philadelphia Academy of Natural Sciences.

cured by the hawks, for as portions of the many canals are cleared, shells of course are often brought to the surface. Far from making use of the abundance of *A. gevesensis* at the rookery, the hawks fly off a considerable distance to other swamps which according to the natives contain slightly brackish water where *A. dolioides* occurs.

Remarkable it seems that the hawks adjust their feeding time to late afternoon when the snails are wont to move about more frequently than during the hours of the sun's greatest glare. These birds, I was told, slowly fly over the swamps, often just high enough to be out of reach of the vegetation and slow up but little when swooping down for the shell, which is caught in the claws of one foot. Though Quelch, as cited by Chubb,[1] did not realize that he observed how the shells were actually taken, he gives an exact account of the procedure: "While settling down to roost by the creek-side, this species [*Rostrhamus sociabilis*] will be noticed darting down and skimming for short distances almost on the surface of the water, as though catching insects. . . ." At the season I visited the rookery, the *Rhostrahamus* had no young, but usually flew back home with their prey just the same. It is absolutely necessary for them to have an opportunity to perch to remove the mollusk from the shell. Time and patience are then given full play, and as many as ten may be seen in the branches at once awaiting the opportune moment. Every new arrival is greeted with the oft-repeated harsh call "Kor-ee-ee-a-Koree-a."

The hawks then perch on one foot and with the other quietly hold the snail in such a manner that it can emerge from the shell. The birds make no attempt whatever to extract it by force, but watch for the voluntary extension of the animal beyond the aperture of the shell. With that propitious moment comes the next step in the drama. Quick as a flash the hawk's bill pierces the snail apparently back of the operculum. It happens so rapidly that one is not able to clearly follow the operation. As a further step the snail, now spiked upon the beak, is instantly pushed up to the middle of the upper bill

[1] The Birds of British Guiana. Vol. I, p. 206, London, 1916.

from which it stands off like a bump as big as a large walnut. Then begins a second wait. Gradually the mollusk's muscles relax. A few minutes later the Snail-hawk vigorously shakes its head and before even the light, empty shell has reached the grassy ground *Rostrhamus* has swallowed its victim, operculum and all. It would be necessary to shoot a few of these birds just after the snail is spiked or swallowed to ascertain at what point it is actually pierced. It is certainly always done in the same fashion, for the fragile shell is never injured, not even the tender edges of the aperture. As the mollusk of course exerts its full power of muscular contraction the bill, evidently inserted behind the operculum, is caught between the operculum and the wall of the whorl about opposite the middle of the edge of the aperture.

Empty *Ampullarius* shells lying in the grass on the damp soil disintegrate rapidly. A considerable amount of moisture and even decayed vegetable detritus accumulates in some which happen to fall with the aperture turned up. These become the favorite home of a small gray slug (*Omalonyx*). Its thin, transparent, scale-like shell has so slight an attachment to the overlapping fold on the dorsal side that it is cast off when the slug is placed in strong alcohol. The empty *Ampullarius* shells evidently present ideal living conditions and also a certain amount of protection for this slug, as I did not find it anywhere else.

THE POST-GLACIAL DISPERSAL OF MOLLUSCA IN THE SOUTHERN ROCKY MOUNTAINS

BY JUNIUS HENDERSON

The presence of mollusks of various species in nearly all of the ponds and lakes of the southern Rockies, up to and above timber line, and of land snails in the aspen groves and other favorable stations in the glaciated areas, raises interesting questions as to the method of dispersal of mollusks, especially of the fresh-water species. During the glacial epoch glaciers

formed all along the crests of the higher mountain ranges of Colorado and extended down the various gulches from five to sixty miles. Their retreat has been very recent, geologically speaking—so recent, in fact, that there are within the state considerably more than a dozen of them still active, several of which are close to lakes from which we obtained some of the mollusks herein discussed. There is every reason to believe that the divides separating the glaciated gulches were covered with snow the year round. In their retreat these glaciers left hundreds of lakes and ponds, chiefly morainal, many of them completely isolated by rock or morainal barriers, so that no aquatic animals can gain access to them by following streams. In 1920, assisted by Dr. Francis Ramaley and Mr. Harl S Kittle, I examined about sixty lakes, ponds, sloughs, etc., in the glaciated area at the heads of North Boulder, South Boulder and Middle Boulder drainage, in the Silver Lake, Tolland and Eldora districts, Colorado, mostly fram 9,000 to 11,000 feet above sea level. Baker (Bull. Amer. Mus. Nat. Hist., XLI, pp. 527–539, 1919) published an account of a small collection of mollusks obtained in the Tolland district by Professor Frank Smith, and Cockerell (NAUTILUS, XXV, pp. 58–59, 1911) published a list of land snails from the same district. In our work in 1920 we found *Pisidium* at almost every station, even above 11,000 feet. Dr. Sterki's recent account (NAUTILUS, XXXVII, pp. 16–22, 1923), of this material makes it unnecessary to record the species here. Neither *Sphaerium* nor Naiades have been found here or anywhere else at high altitudes in the mountains of Colorado. In addition to the *Pisidia* we found the following fresh-water mollusks:

Musculium rykholti (Normand). Three ponds near Eldora, middle Teller Lake near Tolland, and lagoon near Los Lagos.

Musculium raymondi (J. G. Cooper). Lake south of Silver Lake.

Lymnaea palustris Muller. Smartweed Lake, Los Lagos and pond east of Eldora.

Lymnaea caperata Say. Lagoon near Los Lagos.

Planorbis exacuus lenticularis Lea. Eldora and Columbine Lakes.

Planorbis similaris Baker. Smartweed Lake (type locality), East Lake, Los Lagos and pond south of Silver Lake (altitude 10,550 feet).

Planorbis trivolvis Say. Smartweed Lake, Los Lagos and pond at Tolland. Baker recorded a single specimen from Smartweed Lake under the name *P. plexata* Ingersoll. A comparison of a good series from that lake and Los Lagos with *P. trivolvis* from many other localities fails to disclose any constant character separating our material from typical *trivolvis*.

Planorbis umbilicatellus Cockerell. Lake Eldora and three neighboring lakes.

Planorbis vermicularis Gould. Lily Lake, near Lake Eldora.

Physa smithiana Baker. Upper Teller Lake (type locality).

Physa virgata Gould (*traskii* Lea). Smartweed Lake.

We also obtained the following land snails:

Aspen groves near Tolland—*Agriolimax campestris* (Binney), *A. c. montana* (Ingersoll), *Cochlicopa lubrica* (Müller), *Columella alticola* (Ingersoll), *Euconulus fulvus alaskensis* Pilsbry, *Gonyodiscus shimeki cockerelli* (Pilsbry), *Polita hammonis* (Ström.), *Punctum rel. conspectum* (Bland), *Pupilla blandi* Morse, *Pupilla hebes* Ancey, *Succinea avara* Say, *Vallonia gracilicosta* Reinh., *V. costata montana* Sterki, *Vertigo concinnula* (Cockerell), *Vitrina alaskana* Dall, *Zonitoides arborea* Say. Aspen and narrow-leafed cottonwood groves near Eldora—*Agriolimax campestris*, *Euconulus f. alaskensis*, *Gonyodiscus s. cockerelli*, *Polita hammonis*, *Pupilla blandi*, *Thysanophora ingersolli* (Bland), *Vallonia cyclophorella* Ancey, *Vertigo concinnula*, *Vitrina alaskana*, *Zonitoides arborea*. Aspen groves at New University camp near Silver Lake—*Agriolimax campestris*, *Euconulus f. alaskensis*, *Gonyodiscus s. cockerelli*, *Punctum rel. conspectum*, *Vertigo modesta*, *Vitrina alaskana*.

As a rule the land snails are not found much above 9,500 feet, and at that altitude the aspens give way to pure coniferous forests, but we found *Vitrina* occasionally up to timber line under shrubs.

In 1923, accompanied by Mr. John P. Byram, I did intensive collecting in another glaciated area on Grand Mesa, from 9,000 to 11,000 feet above sea level, about 125 miles southwest of

Tolland. Here again we found *Pisidium* in almost every lake and pond, *Musculium* in two or three, and *Lymnaea*, *Physa* and *Planorbis* much more generally distributed than in the other region. The largest *Planorbis* I have seen in Colorado, up to thirty millimeters in diameter, were found here. This material has not yet been worked up, so no list of species can be given.

Obviously there were no mollusks in these glaciated areas when the region was covered with snow and ice the year round. They have been distributed by some agency or agencies, not of their own volition, since the disappearance of the glaciers. The land-snail colonies are separated from one another and from like colonies in the non-glaciated areas by wide stretches of territory unfavorable to their migration. *Oreohelix*, widely distributed at favorable stations throughout the Rockies, is not known to have bridged the gap at all in the Tolland and Eldora districts, but three examples have been found on Mount Audubon, near Silver Lake, at timber line. On the other hand, the small species, which could easily have been brought in clinging to the feathers of birds, are found wherever suitable covering exists. The aquatic forms could not have migrated to these high lakes and ponds of their own volition, because the small streams leading up from the plains are all mountain torrents, wholly devoid of mollusks from the lower edge of the glaciated areas to the edge of the plains. Furthermore, the lakes totally isolated from drainage except by seepage contain mollusks.

It is definitely known that aquatic mollusks have been carried alive long distances by water birds and shore birds, and it seems to me that is the most likely method of dispersal in the glaciated areas of the mountains. True, it would require a very large number of such accidents to have brought in so many species and to have distributed them to so many lakes. As they are found in practically all the lakes in the two large areas examined, it is fair to suppose they are also found in the hundreds of other glacial lakes throughout the mountains. When one considers the vast multitude of birds passing through in migration twice a year and the annual post-nesting migrations of certain species from plains to mountains, it is seen that there have been plenty of opportunities for numerous such accidents.

Also, once having gotten a foothold in a given area, they could easily have been carried from lake to lake over the short intervening distances in the fur and clinging to the feet of various mammals, especially beaver, bear, mink, otter and others which regularly or occasionally take to the water or wade in the edges of the lakes. As so many of the lakes have no connection with streams except by slow seepage through their moraines, and contain no fishes, it is evident that the mollusks could not have been introduced by clinging to fishes. Furthermore, the fish route would not account for the numerous colonies of land snails, while the bird and mammal route would.

Instances of very recent introduction of aquatic mollusks into small ponds are known in the Rocky Mountain region. On a high divide in Wyoming I found a small pool recently made by throwing an earth dam across a small, dry run, to catch the storm water for cattle. It was already inhabited by *Lymnaea bulimoides cockerelli*, which could only have been brought in by birds or some other such agency. In the shifting sandhills of eastern Colorado we have found *Lymnaea* and *Physa* in several ponds entirely surrounded by great sand hills. As the sand shifts rapidly and constantly, they could not have been there many years, certainly not centuries and could not have been brought in along drainage lines. Numerous other such cases are known. The most plausible method of their introduction I have been able to think of in the years spent in observing these facts is by clinging to the feathers of birds and hair of mammals, and this method seems consistent with all the facts and inconsistent with none.

NOTES ON THE DONAX OF CALIFORNIA

BY A. M. STRONG

The first description of a Donax from California was that of *Donax californicus* Conrad, 1837. This was followed by Dr. Gould's *D. obesa* 1851, collected by Lieut. Green at San Diego, and *D. flexuosus* 1857, from Col. Jewett's Santa Barbara collec-

tion. A number of species from Mazatlan, Acapulco and Panama were also described by the early writers.

Carpenter in the British Association Report, 1856, p. 229, lists from Col. Jewett's Santa Barbara collection the following species; *D. rostratus* C. B. Adams,=*culminatus* B. M. Cat., No. 37 ; *D. californicus* Conrad ; *D. gracilis* Hanley ; and *D. flexuosus* Gould. From Lieut. Green's collection from San Diego he lists, p. 232, *D. californicus* Conrad,=*D. laevigata* Deshayes; *D. abruptus* Gould,=*D. californicus* Conrad, var. ; and *D. californicus* Conrad, var. In another place he lists from California, p. 287, *D. conradii* Deshayes,+*D. californicus* Desh. ms. *non* Conr. In his final table he only lists from Upper California the following ; *D. flexuosus*, *D. californicus*, *D. rostratus* and *D. gracilis*.

During Dr. Carpenter's visit to the United States he examined in detail the specimens collected by Col. Jewett and Lieut. Green and in his Supplementary Report, 1863, p. 536, he only lists from Santa Barbara *D. californicus* and *D. flexuosus*; *D. rostratus* being listed from Acapulco and *D. gracilis* from Panama. He states the *D. abruptus* from San Diego should be *D. obesus* Gould, and adds from the collection of Major Rich *D. californicus* from Monterey. In the final table in the Report, p. 640 he reduces the California list to *D. californicus* Conr. (*non* Desh)= D. *obesus* Gould, (*non* Desh.) and *D. flexuosus* Gould. To these he adds *D. navicula* Sowerby, from the southern fauna.

In the Mazatlan Catalogue, 1857, Dr. Carpenter mentions some of the names used for the California shells as follows ; under No. 75, *D. punctatostriata* Hanley, he gives?=*flexuosus* Gould's plates, and under No. 76, *D. conradi* Desh., gives+*D. californicus* Conr. teste Desh., adding "The *D. californicus*, teste Nuttall, whose shells were the basis of Conrad's description, is very different from the shell so named by Deshayes in the Br. Mus. and Col. Cuming."

In 1900 Dr. Dall in the Transactions of the Wagner Free Institute of Science, vol, 3, part 5, p. 968, points out that the shell identified as *D. navicula* by Carpenter is the true *D. californica* of Conrad and he applies the name *D. laevigata* Desh. to the shell considered to be *D. californicus* by Carpenter=*obesa* Gould. Finally in 1919, finding that *laevigata* Desh., could not

be used, Dr. Dall suggests the new name *D. gouldii* Dall for this species. In the same connection he states that the specimens on which Dr. Gould based his description of *D. flexuosus* are identical with the West Indian *D. striata* Linne, and are undoubtedly a case of mixed locality labels.

This reduces the recognized species of Donax from California to two, variously given as follows :

Donax californica Conrad, 1837. Journ. Acad. Nat. Sci., Phila., vol. 7, p. 254. Bull. U. S. Nat. Mus. No. 112, p. 49.

D. navicula Sby., Cpr. Brit. Ass'n. Rep't. 1863, p. 640.

D. flexuosus Gld., Cooper, 7th Ann. Rep't Cal. St. Min., p. 238.

D. flexuosus Gld., Williamson, Proc. U. S. Nat. Mus., vol. 15, p. 186.

D. flexuosus Gld. Keep, West Coast Shells, ed. 1892, p. 192.

D. californicus Conr., Dall, Trans. Wagner Inst. Vol. 3, p. 968.

D. californicus Conr., Arnold, Pal. San Pedro, p. 170.

D. californicus Conr., Keep, West Coast Shells, ed. 1911, p. 88.

D. californicus Conr., Fish Bull. No. 4, Cal. Fish and Game Com. p. 47.

Donax gouldii Dall, 1919. Bull. U. S. Nat. Mus., No. 112, p. 49. Boston Journ. Nat. Hist., vol. 6, p. 394 as D. obesus, Gould.

D. californicus Conr., Cpr. Brit. Ass'n Rep't 1863, p. 640.

D. californicus Conr., Cooper, 7th. Ann. Rep't Cal. St. Min. p. 238.

D. californicus Conr., Williamson, Proc. U. S. Nat. Mus., vol. 15, p. 186.

D. californicus Conr., Keep, West Coast Shells, ed. 1892, p. 192.

D. laevigata Desh., Dall. Trans. Wagner Inst., vol. 3, p. 969.

D. laevigata Desh., Arnold, Pal. San Pedro, p. 170.

D. laevigata Desh., Keep, West Coast Shells, ed. 1911, p. 87.

D. laevigata Desh., Fish Bull. No. 4, Cal. Fish and Game Com., p. 47.

Donax punctatostriata Hanley, and *Donax conradi* Desh., both common in the Gulf of California fauna, have been reported from California in published lists. I am unable to find any record to support this among the California collectors. It seems probable that the records were either based on old identifications following Carpenter's statements of the synonymy, *D. conradi* equaling *D. californicus* as used by Deshayes and *D. punctatostriata* equaling *D. flexuosus* Gould, or on valves off boats coming up from the lower coast, as has proven to be the case in several instances. Unless an authentic record of living specimens from California points can be found, both species should be stricken from the California lists. Both Carpenter's record of *Donax gouldii* Dall from Monterey and Dall's from San Louis Obispo County need further verification. It does not seem probable that the species will be found living north of Point Conception.

AMPHIDROMUS VIRESCENS (SWAINSON)

BY BRYANT WALKER

This species was originally described by Swainson as "*Bulimus virescens*" (*Bulimus citrinus* var.?) in the Appendix to the "Catalogue of the Rare and Valuable Shells which formed the celebrated collection of the late Mrs. Bligh," 1822, App. p. 13. The description is as follows:—"Shell obovate, green, variegated with yellow; spire conic, slightly thickened, obtuse; the volutions depressed on the suture and generally reversed; inner lip obsolete; umbilicus open". He further states:—"The same uncertainty exists with regard to this shell, as the last, viz. whether it should be considered as a variety, or as a distinct species, from *B. citrinus* (Zool. Ill., pl. 42). I have seen many specimens, but not one where the inner lip was developed on the upper part, that is, between the umbilicus and the top of the outer lip. If this character be found constant, it should, I conceive, be taken as a good and sound *specific* distinction;

and more than one writer has made it, in other instances, of *generic* importance. In the two varieties of *Bulimus citrinus* (here figured from this collection), and in numerous others which I have inspected, the inner lip is entire, much thickened, and dilated over the umbilicus, which is thus hid in mature age".

Subsequently (Zool. Ills., III, 1822–3, pl. 166, fig. 1) he figured the species as a variety of *Bulimus citrinus* and remarks: The beautiful shells here selected as a further illustration of the Citron Bulimus not only show the great variability of the species, but clearly prove that *B. virescens* is, as I suspected, only a variety of *B. citrinus*. In the shell at fig. I, the upper part of the inner lip (like that described in the Bligh Appendix), is entirely wanting; although it bears, in every respect, the appearance of a full-grown shell; the umbilicus likewise is open; but in the shell at fig. 2 and 3 the inner lip is quite perfect, and consequently folds over the umbilicus; thus the connection between the green and yellow varieties is completely established."

In the second edition of the Exotic Conchology (1846, p. 37) the original description from the Bligh Catalogue with the remarks considerably abbreviated is reproduced.

Since that time the species has been practically lost sight of, which seems rather strange in view of Swainson's statement that he had seen "many specimens". It seems to have escaped the attention of both Pfeiffer and Mousson. It is not mentioned by v. Martens in his "Ost-Asien" and, indeed, he bestows the name on a variety of *Amphidromus furcillatus*. It is not quoted by Fulton in his paper on *Amphidromus* in the Ann. and Mag. of Nat. Hist. (1896). Pilsbry (Man. of Con., XIII, 1900, p. 171) with some doubt referred it to *A. comes* Pfr.

In the account of my copy of Martyn's Universal Conchologist (Naut., XXXII, 1918, p. 80) I mentioned the fact that plate 116 was duplicated and represented two color forms of a sinistral *Amphidromus* that I could not assign to any of the species figured in the Manual of Conchology.

A year or two later in a miscellaneous lot of *Amphidromi* received from the Museum of Natural History of Geneva, Switz-

erland, as *A. perversus* L. from "Java et les iles de la Soude", were two specimens which were evidently the same species as that figured by Martyn. The existence of these shells made it desirable to ascertain the correct specific name. On sending them to Dr. Pilsbry, he identified them as being without much doubt the *Bulimus virescens* of Swainson

According to the printed index in the "Conchologist," plate 116 represented *Limax tiara* from Barbadoes and according to Pilsbry (Man. of Con., IX, p. 189) that is the well known *Polymita versicolor* Born. In the written index to my copy plate 116 is listed as *Bulimus* ——. Dr. Pilsbry informs me that in Chenu's reprint of the Conchologist plate 116 is the *Polymita*, and on inquiry I ascertained that in all of the three other copies in this country in the libraries of Leland Stanford Junior University, the Boston Society of Natural History and the Philadelphia Academy plate 116 represents that species. This would seem to make it clear that the *Polymita* was the species originally represented on plate 116 and to settle the question as to the availability of the name of "*tiara*" for the *Amphidromus*. The explanation for the discrepancy is probably to be found in the fact stated by Quaritch in a recent catalogue (1923, No. 378) that "evidently Martyn only completed copies to order" and as stated in my paper (l. c. p. 32) "everything in the make-up of this copy seems to indicate that it must have been one of the latest copies issued and was made up of such plates as were then on hand". Presumably there being no available copy of the original plate 116, the duplicate plates of the *Amphidromus* were inserted to take its place.

This leaves Martyn's species without a name unless it is the *Bulimus virescens* of Swainson. I have no doubt but that is the fact and that Swainson's species should be recognized as a valid one. As shown on plate V, a comparison of the several figures of Swainson and Martyn and the specimens in my collection make it clear that all belong to the same species, which is characterized by being umbilicated, with no callous deposit on the parietal wall and having a thin, expanded lip. The coloration as usual in the genus is variable. No two of the specimens are exactly alike. They all agree, however, in having the

dark band on the upper whorls and in the dark interior of the aperture. Swainson's type was "green, variegated with yellow". His figure in the Zoological Illustrations has the apical whorls a light yellow with a purplish spiral band, which does not appear on the body-whorl, which is a darker yellow with green longitudinal streaks. Martyn's figures are the most highly colored. The figure on plate 116 (plate V, fig. 2) has the upper whorls a dusky yellow with a band of brownish yellow bordered with red on the apical whorls and reddish brown on the intermediate ones. The body-whorl is green with some yellowish longitudinal stripes and numerous darker green spiral bands. That on plate 116 *bis* (plate V, fig. 3) has the ground color and the bands on the upper whorls lighter in color and the intermediate whorl has the band composed of blotches of green, reddish-brown and yellow. The body-whorl has a subsutural band of yellow with a narrow light-bluish band in the center; this is bordered by a very narrow reddish-brown band, reddish-yellow below, which appears as a peripheral band, but which curiously enough is not shown at all on the figure of the dorsal side. Below the upper brown band the body whorl is green with darker longitudinal stripes.

In my specimens, the smaller (fig. 4) has the apical whorls white with a reddish-brown band; the intermediate whorl has three such bands at first, a narrow subsutural band, which fades out before reaching a narrow reddish-brown varix (which does not appear in the figure), a narrow, rather indefinite, peripheral band and below it a broader one, which coalesces with it just before reaching the varix, from which it is separated by a longitudinal streak of yellow; beyond the varix the upper part of the whorl is at first a light yellowish-white; below this the ground color is a reddish-brown with faint indications of the spiral bands at first and then is overlaid, apparently, by a bluish-green and yellow longitudinal striping; a second varix then appears bordered on each side by yellow, which reaches the aperture where the lip is first appressed to the body-whorl; beyond that the remainder of the body-whorl is dark reddish-brown, running into a dark purple towards the lip, but is separated from the lip, which is white on both sides,

by a bright yellow streak. The lip itself is thin, expanded and sharp-edged. The other specimen (fig. 5) is a little larger and evidently a worn shell, but the general system of coloration is about the same. These shells measure:

Fig. 4, Alt. 45, diam. 23 mm.

Fig. 5, Alt. 48, diam. 26.5 mm.

The synonymy of the species is as follows:

Bulimus virescens Swainson, Catalogue of the rare and valuable shells which formed the celebrated collection of the late Mrs. Bligh, 1822, Appendix p. 13. Exotic Conchology (edition 2), 1841, p. 37.

Bulimus citrinus var. *virescens* Swainson, Zool. Illustr., III, 1822–3, pl. 166, fig. 1.

Bulimus sp. Martyn, Universal Conchologist (Walker copy), 1822?, plates 116 and 116 *bis*.

Amphidromus comes? Pilsbry, Man of Con., XIII, 1900, p. 30.

Amphidromus sp.? Walker, Naut. XXXII, 1918, p. 30.

I am indebted to Mr. E. G. Vanatta for the data in regard to the Bligh Catalogue and to Miss Mina L. Winslow of the Museum of Zoology, Univ. of Mich., for the photographs reproduced in the remaining figures.

Explanation of Plate V

Fig. 1. *Bulimus citrinus virescens* Sw., from the Zool. Illustr.

2. *Bulimus* sp. from pl. 116, Martyn's Universal Conchologist.

3. *Bulimus* sp. from pl. 116 bis, Martyn's Universal Conchologist.

4 and 5. *Amphidromus virescens* Sw., Walker collection No. 59795.

NEW LAND OPERCULATES FROM THE DUTCH LEEWARD ISLANDS

BY H. BURRINGTON BAKER

During the summer of 1922 the University of Michigan Museum of Zoölogy sent me to the Dutch Leeward Islands to collect molluscs, amphibians and ants. With the assistance of an additional grant from the Zoölogical Laboratory of the University of Pennsylvania, I was able to spend fourteen weeks in a rather detailed study of the islands of Curaçao, Klein-Curaçao, Aruba, Bonaire, and Klein-Bonaire. The molluscan fauna of these is rather poor in genera, but rich in specific and subspecific diversity, and in number of individuals.

The following brief, specific descriptions will be amplified and illustrated in a future paper, which will be published by the University of Michigan Museum of Zoölogy.

Helicinidae.

Stoastomops walkeri, new genus and species.

Shell depressed turbinate; reddish in color. Altitude, 2.14 mm.; major diameter, 2.34 mm. Whorls 4½, markedly convex. Growth wrinkles pronounced, irregular. Spiral sculpture of numerous, fine thread-riblets, more obscure on the base of the shell. Umbilicus narrowly rimate. Aperture subbasal, reniform. Peristome simple, sharp, incomplete; columellar wall with whitish callus which ends abruptly in a distinct emargination just above the basal angle. Operculum very similar to that in *Pyrgodomus*, a subgenus of *Eutrochatella*. Radula similar to that of *Stoastoma*, but both A and B centrals have 2 to 3, stout, aculeate cusps; C-central tricuspid; D-lateral with only two very heavy cusps.

This monotypic genus combines, to a remarkable degree, the shell of *Pyrgodomus* with the radula of *Stoastoma*. Type locality: Montagne, Bonaire.

Pomatiasidae.

Cistulopsinae, new subfamily.

In "Das Gebiss der Schnecken" (Vol. I, p. 75, fig. v–1), Troschel pointed out that the radula of the one of the Cuban species differed from several other American members of this

family in the possession of tricuspid centrals and first laterals. He followed Sowerby (Thes., fig. xxxi, 283, 284) and Pfeiffer (1852; Mon. Pneum. viv.) in the identification of the peculiar species as *Cyclostoma candeana* Orbigny, but Pfeiffer showed later (Mon. Pneum., Suppl. I, p. 132) that it was actually *C. illustre* Poey. This important radular difference was recently contradicted by Henderson and Bartsch (1920; P. U. S. Nat. Museum, LVIII, pp. 54–55).

During the examination of the present collection I was surprised to find that the radula of *Cistula raveni* Crosse has tricuspid centrals and 7-cusped inner laterals. Both the centrals and the inner laterals have a large middle cusp with a smaller one on either side, but each inner lateral, in addition, has two minute serrations on either side of the blade of the main cusp, near its base. The outer laterals and marginals are somewhat similar to those of *Tudora*, and do not differ radically from many of the other species of American Pomatiasidae. These radular differences are sufficient grounds for the establishment of a new genus, CISTULOPS, with the monotype *Cistula raveni* Crosse (1872; J. de C. XX, 159), from Curaçao.

This led to the examination of the radulae of 62 species of American Pomatiasidae, but definitely multicuspid centrals and inner laterals were only found in one other species, *Cyclostoma illustre* Poey.* The radulae of my specimens of this last species agree quite well with Troschel's figure, already quoted, although I differentiate two small cusps (instead of one) on either side of the middle cusp of the rhachidian central. As Troschel pointed out that this was sufficient basis for generic separation, the new genus, TROSCHELVINDEX, with the monotype *Cyclostoma illustre* Poey (1857; Mem. Cuba II, p. 33) from Habana, Cuba (A. N. S. P. no. 129153), is here proposed.

Cyclostoma incultum Poey, *C. perplicatum* "Gundlach" Pfr.,

*A. N. S. P. no. 129153; 2 specimens from Colon Cemetery, Habana, Cuba; J. P. Clark, 1921. A. N. S. P. no. 13759; 2 specimens from Cuba; Swift Collection. I wish to express my gratitude to Prof. Carlos de la Torre, for his verification of these identifications. He tells me that the first lot represents a somewhat larger form that occurs around Habana, while the second lot is quite typical and probably came from near Matanzas.

C. largillierti Pfr., and *C. decussata* Lam., all placed by Henderson and Bartsch in their "group of *Annularia illustris*", have fundamentally unicuspid centrals and inner laterals. In addition, the growth ribs of these species are gathered into tufts at the suture, while the sutural crenulations of *T. illustris* are the enlarged ends of individual ribs.

Largely on the basis of the supposed agreement amongst all of the American Pomatiasidae, in the possession of unicuspid centrals and inner laterals, Henderson and Bartsch separated the New World species from their Old World relatives. The subfamily Cistulopsinae is now proposed for the inclusion of these two unconformable genera, *Cistulops* and *Troschelvindex*. The remainder of the American cyclostomates, as far as examined, can be retained in the family "Annulariidae," as defined by Henderson and Bartsch, although, personally, I can see no necessity for the division of the Pomatiasidae into smaller families.

However, the term Annulariidae itself cannot be used in this connection. *Annularia* Schumacher (1817, Essai Nouv. Syst. Hab. Vers. Test., pp. 60, 196) contains two species, *A. aurantiaca* and *A. fimbriata*, both of Schumacher. Each is founded on figures in Chemnitz, and the first is apparently close to *Cyclophorus volvulus* (Müller). The second is described by the citation: "Turbo lyncina Lin. Chemn. 9, sect. 2, pag. 54. Tab. 123, fig. 1060, Littr. a". This cannot be construed as a quotation of *Turbo lincina* Lin. (1758, Syst. X, 765) and *A. fimbriata* Schumacher must be restricted to the figure in Chemnitz, which certainly does not represent the Linnaean species. In fact, this figure totally defies recognition, although Pfeiffer (1852, Mon. Pneum. Viv., 159) identified it, with doubt, as *Cyclostoma fimbriatulum* Sowerby. As a result, Dall's (1905, Proc. Malac. Soc. London, VI, 208) choice of *Turbo lincina* Lin. as the type of *Annularia* is impossible; the only identifiable species of the genus, *Annularia aurantiaca*, is now chosen as its type; and *Annularia* passes into the synonymy of *Cyclophorus* Montfort (1810, Conch. Syst. II, 290).

For these reasons the Jamaican group which has temporarily been known as *Annularia* must revert to its classical

generic title, *Choanopoma* Pfr. (1847, Zeit. Mal., 47), type *Turbo lincina* Lin. (1758). The "Annulariidae" of Henderson and Bartsch may take the name of any of their other subfamilies; Chondropominae would perhaps be most appropriate. Both the Cistulopsinae and the Chondropominae (in this broad sense) agree in the deep pectination of the marginal teeth of the radula.

The two genera of the Cistulopsinae are separated from each other by their opercula, even more markedly than by their radula. That of *Cistulops* consists almost entirely of the chondroid plate, although a few, calcareous granules ornament its outer surface; while that of *Troschelvindex* has an incomplete, but distinct, calcareous portion, which consists of growth lamellae, cemented, at their distal edges, into a poorly developed, calcareous plate. The external surface of this last plate is almost parallel to the chondroid one, but each whorl of the former is slightly narrower than the underlying portion of the latter, so that the appearance of the entire operculum is somewhat similar to that in the genus *Choanopoma*. For reasons that I hope to discuss in a future paper, I am inclined to believe that the operculum of *Troschelvindex* represents the most primitive type in the American Pomatiasidae.

Chondropominae.

Tudora maculata, new species.

Shell elongate-conic, thin; brownish with darker bands, usually broken into rows of flammulations. Altitude (4 whorls): 8.8 mm.; major diameter: 4.5 mm.; aperture: 2.3 mm. Whorls 6½ (usually 4 retained); cylindrical; last whorl descending, solute and slightly tangential. Growth sculpture of crowded, regular, low, rounded threads; spiral sculpture microscopic, of widely spaced threadlets. Umbilicus small. Aperture circular. Peristome sharp, simple, continuous. Operculum with subcentral nucleus; chondroid plate inconspicuous, concave internally; calcareous portion thick, with channeled perimeter; external surface (calcareous plate) distinctly convex and marked by fairly prominent growth-wrinkles.

Type locality: Montagne, Bonaire. I had originally intended to name this very distinct, little species for Dr. H. A. Pilsbry, but recently found that lot number 13761, in the collection of

the Academy of Natural Sciences of Philadelphia, is certainly the same form. This set is labeled: "*Cistula maculata* Bland, Buen Ayre, W. I." I can find no reference to these shells in the literature, but think it safer to introduce Bland's appellation. The superficial resemblance of this species to the young of *Cistulops raveni* probably deterred its description.

TUDORA RUPIS, new species.

Shell similar to *T. aurantia* (Wood), but smaller and thinner. Altitude (5¼ whorls): 14.0 mm.; major diameter: 7.6 mm.; altitude of aperture: 6.2 mm.; diameter of aperture: 5.2 mm. Whorls about 9 (4½ usually retained), not markedly convex. Growth-sculpture of quite regular, but usually obscure, low, rounded cords. Spiral sculpture of prominent, rounded ridges, which are rarely surmounted or broken by the growth-sculpture, Umbilicus rimate. Aperture ovate, with the long axis quite oblique to that of the shell. Peristome sharp, incomplete; rather abruptly expanded on the palatal and basal walls; lobate at parietal angle and auriculate at basal; very slightly expanded in the columellar region. Operculum similar to that of *T. aurantia*, but with much thinner calcareous portion.

Type locality: base of northern escarpment of the Tafelberg of Santa Barbara, southern Curaçao.

TUDORA MUSKUSI, new species.

Shell similar to *T. aurantia*, but heavier. Altitude (5 whorls): 15.8 mm.; major diameter: 8.9 mm.; altitude of aperture: 6.3 mm.; diameter of aperture: 5.6 mm. Whorls about 8½ (usually 5 retained). Growth sculpture of widely-spaced, very prominent and heavy, angular costae, with a few, obsolescent cords between them; very similar to *T. costata* ("Menke" Pfr.; 1846, Zeit. Mal., 47; Chemn. II, fig. ix-9,10). Spiral sculpture of almost obsolete, rounded thickenings, which are usually evident only as undulating buttresses along the sides of the growth costae; towards the umbilicus they become much more prominent. Umbilicus rimate. Aperture small, almost circular, with long axis inclined at about 45° to that of shell. Peristome sharp, incomplete; not expanded at parietal angle and with upper palatal wall slightly emarginate; slight expansion of lower and palatal and basal regions terminates abruptly just beyond the slightly auriculate basal angle; columellar wall scarcely expanded. Operculum similar to *T. rupis*.

Type locality: top of shore cliffs, Knip Baai, northern Curaçao. This species has a much more nearly circular aper-

ture than has *T. costata*, the habitat of which is still unknown. I do not believe that *T. costata* occurs in the Dutch Leeward Islands, as none of the thousands of specimens examined shows any tendency to approach its strikingly elongate aperture.

TUDORA PILSBRYI, new species.

Shell much thinner and more depressed than *T. megacheilos* (Potiez et Michaud). Altitude (3¾ whorls): 16.0 mm.; major diameter: 12.4 mm.; altitude of aperture: 9.1 mm.; diameter of aperture: 8.9 mm. Whorls about 7 (usually 3½ retained); very convexly rounded and with deeply impressed sutures. Growth sculpture of regular, compressed riblets, which are quite closely spaced but are narrower than their interspaces. Spiral sculpture of numerous, regular, compressed, angular riblets, which are heavier and slightly higher than the growth riblets; intersections developed as prominent, sharp, pyramidal cusps. Umbilicus much larger than in *T. megacheilos*. Inner outline of aperture almost circular. Peristome roughly triangular and markedly undulate; parietal angle lobate; upper palatal wall markedly emarginate; lower palatal wall extensively developed but scarcely expanded; basal wall abruptly expanded; basal angle flattened; columellar wall auriculate below. Operculum similar to that of *T. megacheilos*, but deeply concave externally.

Type locality: base of northern escarpment of the Tafelberg of Santa Barbara, southern Curaçao.

TUDORA FOSSOR, new species.

Shell more elongate and thinner than *T. megacheilos*. Altitude (complete): 13.0 mm.; major diameter: 7.5 mm.; altitude of aperture: 5 9 mm.; diameter of aperture: 5.5 mm. Whorls 6 (usually 3½ retained); the diameter increases uniformly from the first to the last, while in *T. megacheilos* the latter whorls enlarge more rapidly than do the earlier ones. Sculpture similar to that of *T. pilsbryi*, but growth riblets more compressed and intersectional cusps more lanceolate in outline. Umbilicus and aperture smaller than in *T. megacheilos*. Peristome similar to the latter species, but with less extensively expanded columellar wall, slighter palatal emargination and thinner internal callus. External surface of the operculum more concave than in *T. megacheilos*, but much less so than in *T. pilsbryi*.

Type locality: valley between Seroes Palomba and Baha Hoendoe, northern Curaçao. This is the only *Tudora* from Aruba, on which island two subspecies occur.

ON THE NAIADES OF LONG ISLAND, N. Y.

BY N. M. GRIER, PH. D.
Dartmouth College, Hanover, N. H.

The following species are cited as occurring in this region: *Elliptio complanatus* Dillwyn (1). Described as being moderately abundant at Riverhead. *Anodonta implicata* Say (2, 3). Found in lakes at Prospect Park, Brooklyn, and at Baisely's Lake, Jamaica South. *Anodonta cataracta* Say (3), from Kissena Park Lake, Flushing. The writer notes the occurrence of this species at Lake Ronkonkema, a glacial kettle-hole lake near the center of the island, where it seems fairly common. This species is widely distributed over the Atlantic slope. A number of specimens were transferred to St. John's Lake, Cold Spring Harbor, in August 1923, where their further progress may be noted.

Ortmann remarks of the close relationship of *cataracta* and *implicata*, the latter differing from the former only by a thickening of the shell along its lower margin, a distinction hardly noticeable in young shells. *Anodonta* sp. are usually thin shelled under any condition of environment. Their ready adaptation to the lime-free waters of Long Island is thus easily understood. *E. complanatus* is a puzzling species due to the large number of variants representing it. While it is described as having a moderately thick shell, yet a form of it with shell so soft as to be easily indented with the finger, has been reported from a soft-water lake in Maine (4). This would seem to indicate similar adaptability as the *Anodontas*. All are members of the depauperate Atlantic Coast Fauna, having been reported from New England by Johnson (5), and being found further south. The fair probability is their introduction on Long Island, one way or another through the agency of birds.

A similarly curious distribution is reported for *A. cataracta* from the Tennessee drainage. This shell is not found in the Upper Tennessee drainage above Chattanooga except at a small pond near Knoxville, and at Wartburg on the Emory River. Yet it is abundant in the adjacent Cumberland river. Here

again transportation by birds is the most plausible factor to invoke to account for its presence in the pond at Knoxville, inasmuch as it is absent from the main river. Finally with regard to Long Island shells, it is undoubtedly true that other species can be transported similarly, but it is possible that the chemical composition of the water has favored the species cited.

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A LIST OF MOLLUSKS FROM INTERVALE, N. H.

BY HARALD A. REHDER

Following is a list of mollusks collected at Intervale, New Hampshire, during the last few years. Shells from this region, and the White Mountains in general, are not very common, and it is hoped this list will prove interesting. The land shells were largely collected in the woods on the side of Mt. Bartlett. Mr. Charles W. Johnson aided in naming the land shells, and the only Musculium was kindly determined by Dr. V. Sterki.

Polygyra albolabris (Say).

Dead and faded specimens were fairly common. Living shells, mostly young, were found on several occasions.

Polygyra fraterna (Say).

One live specimen found under damp leaves.

Pyramidula alternata (Say).

One live shell found in the sap hole of a maple.

Pyramidula cronkhitei anthonyi Pils.

Several living specimens from leaf mould.

Zonitoides arborea (Say).

One specimen from leaf mould. Found in company with the following two species.

Vitrea hammonis (Strom).

Three specimens.

Vitrea indentata (Say).

One specimen. This is believed to be a new record for New Hampshire, the previous northernmost record for New England having been from Cape Elizabeth, Maine.

Anodonta cataracta Say.

Four specimens collected in a small brook flowing into the Saco River. This stream, at the time of collecting, was partly dried up, forming several pools. Many more were seen, one of which measured about 6½ inches in length.

Musculium rykoltii (Normand).

The first record for New Hampshire. Many specimens of this species were found in the same brook as that in which the preceding species was found.

Planorbis antrosus Conr.

Several specimens found along with the preceding species.

NOTE ON THE DISCOVERY OF ORYGOCERAS IN THE IDAHO TERTIARIES

BY WILLIAM HEALEY DALL*

In 1902 the Croatian paleontologist Brusina published an atlas of engravings illustrating the remarkable fresh-water fauna of the Tertiaries of Dalmatia, Serbia, Croatia and Bosnia. This includes some unique forms not represented in the recent fauna, and known from no other region, many of them so different from anything now known from fresh water as to seem almost incredible.

In 1909 Mr. A. A. Hinkley obtained in the state of San

* By permission of the Director of the U. S. Geological Survey

Luis Potosi, from the Panuco river system some amnicoline shells which were recognized by Dr. Pilsbry as closely related to some of Brusina's genera, and who described them under the names of *Emmericiella* and *Pterides* (NAUTILUS, XXIII, pp. 45–49, pl. 5). It is not certain that these bleached specimens represent living species.

The U. S. Geological Survey recently received from Prof. F. A. Thomson a chunk of rock collected from Castle Creek, Owyhee Co., Idaho, from strata regarded by Meek, C. A. White, and Gabb as Miocene, which was submitted to the writer for examination. The matrix consisted of rather large rounded sand grains strongly cemented together and containing numerous fresh-water shells, *Sphaerium*, *Pompholyx*, and *Melania turneri* Gabb, among the most conspicuous. A close examination disclosed specimens of at least three species of Brusina's genus *Orygoceras* (1882), a remarkable tubular shell recalling the Caecid genus *Parastrophia*, but less arcuate, more slender and with a more involved nucleus.

The matrix is so flinty and the minute shells so extremely fragile, that several were lost in the endeavor to extricate them, but at least three species were recognized; one smooth, resembling Brusina's *O. corniculum*, one twisted, like his *O. fistula*, and a third laterally carinate somewhat like *O. enemopsis* Brusina, but more slender and with a crenate apex. A single specimen like *Pterides rhabdus* Pilsbry, but with the aperture concealed, a tricarinate *Pyrgula* and a shell somewhat like *Lithoglyphus fuchsi* Brusina, were also noted.

In this connection attention may be called to some fossils from a shaly deposit on the Rio Carboneras falling into a tributary of Lake Isabal, Guatemala, recently received; among others they comprise a large *Cyrenoida* , and a shell obviously a typical *Tryonia*, but which if found in Serbia would doubtless be referred to *Prososthenia* Neumayr.

This relation between our fresh-water Tertiaries and those of southeastern Europe is extremely interesting and calls for further investigation.

NOTES ON THE ANATOMY AND TAXONOMY OF CERTAIN LAMPSILINAE FROM THE GULF DRAINAGE

BY A. E. ORTMANN, PH. D.

(*Continued from page 60*)

MEDIONIDUS ACUTISSIMUS (Lea).

Also this species differs from *M. conradicus* in the reticulated painting and the coarser corrugations of the posterior slope. It differs from *M. parvulus* by the fact that the rays are more frequently present and rather broad (but also composed of reticulations). From both, *conradicus* and *parvulus*, it is distinguished by more prominent posterior ridge and pointed posterior end. The nacre is very frequently of a reddish or salmon color.

The soft parts have been described by Lea (under *U. rubellinus*, Obs. 6. 1858). He reports that the marsupium occupies nearly the whole length of the outer gill, with a wide reddish-brown border on the edge. The inner lamina of the inner gill is free nearly half of the length of the abdominal sac.

In my specimens I have found that the inner lamina of the inner gills is free for about one-half of the abdominal sac (more or less). In the gravid female, there are 2 to 4 long papillae on the mantle-edge in the same position as in the other species. These papillae are cylindro-conical in shape. The marsupium is large, yet it does not occupy the whole gill, but a large section in the middle of it, leaving non-marsupial a more considerable portion anteriorly, and a smaller portion posteriorly (it is quite probable that it is smaller in younger specimens). The number of ovisacs on the left side is at least 22 (with some posterior ones discharged); on the right side, they are hard to count, since they are largely discharged, but probably there were still more of them. Also my specimen has the margin of the marsupium broadly colored with brown pigment. Color of soft parts rather light: the black of *conradicus* and *parvulus* being replaced by brown.

Glochidium of the same shape as that of the other species, but larger: L. 0.26 to 0.27, H. 0.32 to 0.33 mm.

Thus the anatomical investigation furnishes in the larger marsupium with brown edge, in the prevailing brown, not black, pigment of the soft parts, and in the larger glochidia additional specific characters for *M. acutissimus*. The latter, in its affinities, if more remote from *conradicus*, while *parvulus* stands very close to this.

4. Carunculina paula (Lea) (1840).

Simpson, 1914, p. 159.

Choctawhatchee River, Blue Springs, Barbour Co., Ala.—soft parts of 4 males and 5 barren females, H. H. Smith coll., Oct., 1915.

The anatomy of these specimens agrees in all respects with that of *C. parva* (Barn.) (see: Ann. Carn. Mus. 8, 1912, p. 338, and Naut. 28, 1915, p. 129). In one of my specimens, a female, the supraanal opening is closed, in the others open. There is some blackish pigment at the edge of the marsupium. The caruncle is white or brownish.

These specimens have been identified (as *Lampsilis paula*) by B. Walker, but since I do not possess the shells, I cannot exactly say what Walker understood by this name. However, specimens in the Carnegie Museum from various sources, among them two thus labeled, received from the Alabama Museum (from Chattahoochee River, Columbus, Muscogee Co., Ga.), hardly differ from *C. parva* (Barnes). They do not have the cloth-like epidermis seen in the typical *parva*, and young shells are not so black, but more greenish, with lighter concentric bands. Further, the female is more distinctly swollen and dilated in the postbasal region. But these characters occasionally may turn up in *C. parva*, chiefly in southwestern (Arkansas) material.

5. Carunculina mœsta (Lea) (1841).

Toxolasma lividum (Raf.) Ortman, Proc. Amer. Philos. Soc. 57, 1918, p. 573; *Car. mœsta* Ortmann, Naut. 34, 1921, p. 89.

U. corvunculus Lea, 1868.

Othcalooga Creek, Calhoun, Gordon Co., Ga.—a number of shells, and soft parts of one gravid female, H. H. Smith coll., July, 1913.

Choccolocco Creek, White Plains, Calhoun Co., Ala.—1 barren female with soft parts, H. H. Smith coll., July 31, 1915.

All these specimens were labeled *corvunculus* by Walker. I have pointed out, that the shell named *corvunculus* cannot be distinguished from *T. lividum* (=*C. mœsta*) of the upper Tennessee drainage, and also the soft parts do not differ from specimens from East Tennessee and the Ozarks (Naut. 34, 1921, p. 89). Also the glochidia are the same.

My specimen with glochidia was collected in July, which confirms the late end of the breeding season observed in other instances in this species.

This is one of the species indicating the close connection of the Alabama-fauna with that of the Tennessee. *C. mœsta* is found in the Cumberland-Tennessee drainages and in the Ozarks, and its variety *glans* (Lea) in the central basin, south to Arkansas, but not on the Gulf plain. But the typical *mœsta* is present again (under the name of *corvunculus*) in the Alabama drainage, chiefly in the headwaters. It should be mentioned, in this connection, that *glans* has been reported by Simpson (1914, p. 154) from Etowah River, Ga.: there is no doubt, in my opinion, that this refers to *mœsta*.

6. Micromya nebulosa (Conrad) (1834).

Ortmann, Proc. Amer. Philos. Soc. 57, 1918, p. 577.

This is a common species in the Cumberland and Tennessee drainages, and is very variable. But it is also found in the Alabama drainage, and in the Chattahootchee system in Georgia. In fact, its *type-locality* is in the headwaters of the Black Warrior River in Alabama ("mountainous regions of Alabama, in the Black Warrior River").

The following synonyms founded upon specimens from this region have been ascertained previously (l. c.).

U. radians Lea (1857). Probably a rather normal female, with wide rays. Nacre white or rose. Othcalooga Creek (near Calhoun), Gordon Co., Ga. (tributary to Oostanaula, headwaters of Coosa).

U. jonesi Lea (1859). Normal female, with narrow rays.

Nacre white or salmon. Euharlee Creek, Bartow Co., Ga. (tributary of Etowah River, headwaters of Coosa).

U. sparus Lea (1868). A normal male with well developed rays. Nacre salmon. Swamp Creek, Whitfield Co., Ga. (tributary to Conasauga River, south of Dalton, headwaters of Coosa).

U. linguaeformis Lea (1860). A male, with poorly developed rays, but normal in shape. Columbus, Ga. (Chattahoochee drainage; also reported from French Broad River in Tennessee).

U. simus Lea (1838). A male with strongly developed rays, originally described from Cumberland River, but reported by Simpson (1914, p. 124) also from Othcalooga Creek Gordon Co., Ga.

To these, however, should be added the following synonyms.

U. plancus Lea (1860). Already Simpson (1914, p. 125) suspects that this is only a form of *nebulosus*. The figure represents a male, and it is a rather short *nebulosus*, with rays well-developed. Such specimens are not at all rare. Coosa River, Wetumpka, Elmore Co., Ala.

U. difficilis Lea (1868). Made a synonym of *plancus* by Simpson. The figured specimen is a small, rather shoot male, with few rays. Swamp Creek, Whitfield Co., Ga. (also given from headwaters of Holston River, Washington Co., Va.).

I have before me a rather large number of this species from the Coosa drainage, from Conasauga River in Polk Co., Tenn., from Swamp Creek, Whitfield Co., Ga. (type-locality of *sparus* and *difficilis*), from Cowan Creek, Cherokee Co., Ala., Little Wills Creek and Green Creek, Etowah Co., Ala.; Shoal Creek, St. Clair Co., Ala.; Choccolocco Creek, Talladega Co., Ala.; and Spring Creek, near Kewatchee Springs, Shelby Co., Ala. I have also material from the Cahaba River, in Bibb Co., Ala.

All this material shows that *M. nebulosa* is widely distributed in this region, and that the Alabama-form cannot be distinguished from that of the Tennessee. In Conasauga River, at Conasauga, Polk Co., Tenn., I collected myself 2 males and 1 gravid female (discharging glochidia, May 24, 1915). The anatomical characters are those of *M. nebulosa*, and also the glochidia are identical.

The presence, in this case of the identical species, both in the upper Tennessee and the Alabama drainages should be particularly noted, since this type of shell, although it extends (as *M. iris*) westward to the Ozarks, and northward all over the Mississippi and Ohio drainages, is not found to the southward and southwestward. Thus a connection of the Alabama range with that of the interior basin by way of the costal plain and up the Mississippi valley is excluded, and we must assume that this species managed to get across the divide between the Alabama and the Tennessee. It also should be noted that this species has been recorded from the Chattahoochee (*linguaeformis*). Simpson gives also Wolfsville, Union Co., N. Car. This is in the Catawba-Wateree drainage, far away from the rest of the range, and appears as rather doubtful.

7. Micromya vibex (Conrad) (1834).

Simpson, 1914, p. 136.

A species widely distributed in the Gulf drainage from Mississippi to Georgia, with a variety (*nigrina* Lea) in Florida. It is closely allied, in the shell characters, to *M. nebulosa*, but generally more elongate, with very well developed rays, which usually are wide and stand rather crowded, although they may be absent on the anterior part of the shell. The rays are not "wavy", as Simpson describes them, but rather interrupted, spot-like, but not always so. On account of the crowded character of the rays, the general color of the epidermis appears rather dark, dark green to blackish. The nacre is mostly white, rarely reddish. The shell grows to a larger size than that of *M. nebulosa*; the posterior expansion of the female is of about the same character. The synonyms given by Simpson surely belong here; they are: *U. exiguus* Lea (1840); *U. stagnalis* Conrad (1849); *U. rutilans* Lea (1856); *U. subellipsis* Lea (1856).

I have material from the Tombigbee, Sipsey, and Black Warrior River systems, from the Cahaba and Coosa drainages, up to Murray Co., Ga. and Polk Co., Tenn.; from the Escambia and Choctawhatchee drainages in southern Alabama and from the Chattahoochee in Georgia. Soft parts are at hand from the following localities.

Conasauga River, Conasauga, Polk Co., Tenn.—2 males and 1 young female, A. E. Ortmann coll., May 24, 1915.

Little River (trib. to Chattooga), Cherokee Co., Ala.—1 young male, 1 gravid female (glochidia), H. H. Smith coll., Octob., 1915.

Choccolocco Creek, White Plains, Calhoun Co., Ala.—1 male, 1 female, H. H. Smith coll., July 31, 1915.

Choctawhatchee River, Blue Springs, Barbour Co., Ala—1 barren and 1 gravid female (glochidia), H. H. Smith coll., the former May 11, the latter Octob., 1915.

The specimens from the Choctawhatchee were labeled by Walker: *vibex* var.? I do not have the shells of them. But other specimens with shells from the Choctawhatchee drainage, thus labeled, are surely *vibex*, differing only by more or less purplish shades in the nacre, thus forming a transition to the var. *nigrina*, known from Florida. Whatever they are, the soft parts do not differ from those of *vibex*.

I have described (Ann. Carnegie Mus. 8, 1912, p. 340) the barren female of *M. vibex nigrina* (Lea). The mantle margin of the typical *vibex* essentially agrees with this. There are about 12 (or more, in *nigrina* 10) cylindro-conical papillae, of large or medium size, which are somewhat distant from each other, with a few smaller ones anterior to them. In young females, the larger papillae are nearly the same size; in the larger ones, they are more irregular, and stand at irregular intervals, and the posterior part of the mantle-edge may be without them; but a group of 6 to 8 large papillae in its anterior part is evident.

The marsupium is of the normal Lampsiline type; the number of ovisacs varies with age, from a few up to 25 or 30. The edge of the marsupium has blackish pigment.

Anal opening separated from the supraanal by a moderate mantle-connection. The anal has crenulations, the branchial opening has papillae. Inner lamina of inner gills connected with abdominal sac. Palpi with posterior margins connected at base only. The male has a few, small, and distant, rudimentary papillae on the mantle edge. Color of soft parts whitish, anal and branchial openings with black pigment, and

a streak of this runs forward along the mantle-margin. Papillae of female blackish-brown.

Glochidium subspatulate, of similar shape to that of the *iris*- and *lienosa*-groups, and closely agreeing with it in dimensions, L. 0.21, H. 0.27 mm.

Thus the anatomy bears out the relationship of this species to *M. nebulosa* and *M. iris*, and we should regard *M. vibex* as at least closely allied to *nebulosa*, from which it may have descended. The slight irregularity in the papillae of the mantle-edge, in size as well as in their distance from each other, is transitional towards forms like *lienosa*, and thus *M. vibex* may present, to a degree, a connection between the *iris*- and *lienosa*-groups.

It should be pointed out that we thus have, in the Alabama system, two species representing the form *nebulosa* of the Tennessee-drainage: an identical one, *nebulosa*, and a closely allied, but different one, *vibex*. For the latter, of course, the same should be said with regard to its origin, as to the former. However, *vibex* being distinct from *nebulosa*, we are to conclude that the conditions which brought about its distribution prevailed at least twice, at different times during the geological and geographical history of this region. There was an older connection of the waters, permitting a first immigration of the *nebulosa*-stock into the Alabama-system. This stock changed in the course of time into *vibex*, and reached a wider distribution upon the coastal plain (as far as Florida). A second immigration took place later, and the *nebulosa*-stock which then reached the Alabama-drainage did not have time enough to change its characters, and remained more geographically restricted (to the Alabama and Chattahoochee systems, chiefly in the headwaters).

(*To be continued*)

NOTES

Succinea avara Say, from the tar pits of California. The University of California possesses a very large collection of bones of birds and mammals which have been taken from the asphalt pits of Rancho la Brea, Los Angeles County, California. The cleaning processes through which the material goes consist in part of boiling in a vat of gasoline. Much of the bitumen goes into solution and foreign material settles to the bottom as a sludge. This consists chiefly of sand which has been thrown into the tar lake throughout its existence.

Such an excellent trap as this pit has been for birds and mammals would be expected to be equally successful for land snails but so far as the writer is aware they have never been recorded from there. It is therefore a pleasure to be able to announce the discovery of a single shell of *Succinea* in those Pleistocene deposits. The specimen was found by Mr. Clarence Ryan inside one of the numerous wolf skulls taken out some years ago, and was submitted to me by professor Bruce L. Clark.

The shell cannot be distinguished from specimens which have been found living in numerous places in the Pacific Coast States and which are usually identified as *S. avara* Say. Whether careful study would show that this species is so wide spread as has been reported or if the Pacific Coast specimens belong to a different form cannot be stated at this time.—G. Dallas Hanna.

Parviterebra. Dr. Bartsch has omitted one important name from his Key to the Terebridae (supra, pp. 60–64). This is the genus *Parviterebra* of Pilsbry, Proc. Acad. Nat. Sci., Philadelphia, lvi, p. 5, founded on the Japanese species *paucivolvis* Pils.

It is a small but very distinct Indian Ocean group, superficially akin to *Mazatlania*, and includes *thyraca* Metwill from the Persian Gulf and *separanda* Tomlin from South Africa.—J. R. le B. Tomlin.

PUBLICATIONS RECEIVED.

THE MOLLUSCA COLLECTED BY THE UNIVERSITY OF MICHIGAN—WILLIAMSON EXPEDITION IN VENEZUELA. By H. B. Baker (Occasional Papers, Museum Zool. Univ. Mich., no. 137, pp. 1–5, July, 1923). Part one treats of the shells of Curaçao and part two of the terrestrial operculates of Venezuela. Keys including all the species of the region are given, and eight new species and subspecies are described and figured.

THE GENUS SCULPTARIA PFEIFFER, WITH DESCRIPTION OF THREE NEW SPECIES. By Henry C. Burnup (Annals Natal Mus., Vol. 5, pt. 1, pp. 1–4, pls. 1 and 2, 1923).

MOLLUSQUES TERRESTRIS ET FLUVIATILES DE SYRIE. Par Louis Germain (Voyage Zoologique d'Henri Gadeau de Kerville en Syrie (Avril-Juin, 1908). Vol. 2, 523 pages, 1921; Vol. 3, 242 pages, 23 plates, 1922). Volume 2 contains the Gasteropods and volume 3 the Pelecypods and plates. With a complete bibliography and fully illustrated it is a most exhaustive work on the molluscan fauna of that region.

MOLLUSCA OF THE SOUTHWESTERN STATES.—XI. By Henry A. Pilsbry and James H. Ferriss (Proc. Acad. Nat. Sci. Phila., Vol. 75, 1923, pp. 47–103, pls. 1–8, 12 figures in text). This latest addition to the series of papers by the same authors dealing with the snails of the great American desert is one of the most valuable of all. It is divided into four parts, the first two of which deal with collecting stations in various mountain ranges in Arizona and the known faunas of each are brought down to date. Part III gives voluminous notes on many species old and new. A great deal of information is given on the anatomy of *Sonorella*, and five full plates of drawings illustrate the genitalia of the various species discussed. A Mexican species of *Bulimulus* is added to the Arizona fauna. Six new species and nine new subspecies are described in the paper. The last part is devoted to a clearing up of the uncertainty which has surrounded *Micrarionta rowelli* (Newcomb) for almost sixty years. The type specimen is illustrated; a new species found with it is described as *M. newcombi* and the

type locality of both is fixed at Tinajas Altas, Gila Mountains, Arizona.

It is quite evident that Messrs. Pilsbry and Ferriss are paving the way for one of the most monumental zoogeographic studies ever attempted in North America. Their final results will have a far-reaching importance in the study of zoology and taxonomy and perhaps in geology as well. The vast amount of detailed work involved can scarcely be appreciated by one who has not attempted such an undertaking, in at least a small way. The handling of such large series of specimens and records would be a fruitful source of error in untrained hands. But that these gentlemen are equal to their responsibilities is shown by a careful check and cross check of the first several pages. A single error was detected, and that typographical; *thyroides* is spelled *thyroidus* on page 51 line two.—G. Dallas Hanna, California Academy of Sciences.

Proceedings of the Malacological Society of London (Vol. 15, pl. 4, Oct. 1923). On the External Characters of Sinum planulatum. By G. C. Robson, pp. 268 and 269.

Masculine Deficiencies in the British Vertigininae. By Hugh Watson, pp. 270–280.

The Presence of a Sub-cerebral Commissure in the Orthurethra. By Hugh Watson, pp. 280–283.

The Anatomy and General affinities of Ochthephila (=Geomitra) turricula Lowe. By Hugh Watson, pp. 283–293, pl. 6.

On the British species of Truncatellina. By A. S. Kennard and B. B. Woodward, pp. 294–298.

Note on the Nomenclature and Systematic Arrangement of the Clausiliidae. By A. S. Kennard and B. B. Woodward, pp. 298–308.

On Turris (Surcula) macella nom. nov. for T. macilenta Melv., nom. preocc. By J. Cosmo Melvill, p. 309.

Some Synonyms in the Veneridae. By J. R. le B. Tomlin, pp. 310–313.

The Morphology of the Nudibranch Genus Hancockia. By F. M. MacFarland (Jour. Morphology, Vol. 38, pp. 65–104, pls. 1–6, 1923).

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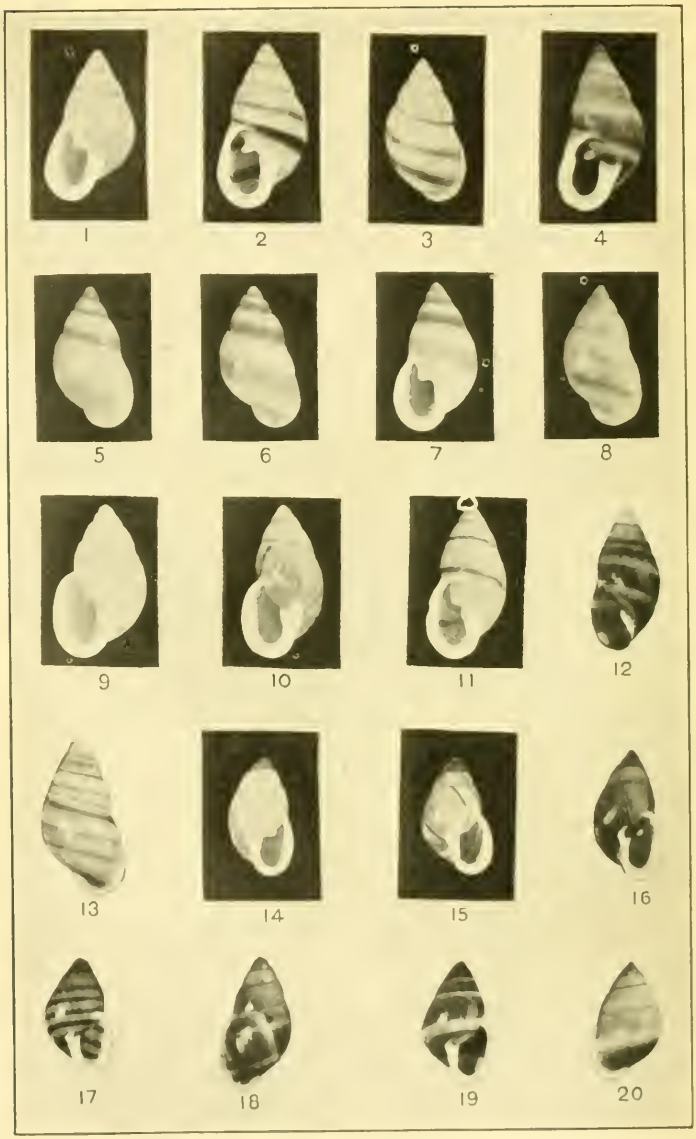
WALKER: AMPHIDROMUS VIRESCENS (SWAINSON)



CRAMPTON: PARTULA FROM MOOREA, SOCIETY ISLANDS

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NEW AND SIGNIFICANT SPECIES OF PARTULA FROM MOOREA, SOCIETY ISLANDS

BY HENRY EDWARD CRAMPTON

The present writer has been engaged for some years in an intensive study of the distribution, variation, and evolutionary relationships of the land gastropods belonging to the genus *Partula*. The species dwelling in the Society Islands have received the most attention on account of their number and variety; the known species of the genus number a little over a hundred, and more than fifty of these occur only in the group specified. All of the islands inhabited by the genus, from Tahiti to Borabora, have been explored during one or more journeys, and the volume on the Tahitian species has been published[1]. Field studies have also been prosecuted in the Cook, Samoan, Tongan, and the Mariana Islands, and a volume on the species of the last-named group has been completed and is shortly to appear.

The island geographically proximate to Tahiti is Moorea, about twenty miles distant, where collections amounting to over forty thousand specimens have been secured in the course of five field trips, from 1907 to 1923. The detailed study of this wealth of material is progressing rapidly with results that entirely confirm the general conclusions of the Tahitian research,

[1] Carnegie Institution of Washington, Publication No. 228, 1917.

while in addition abundant evidences have been discovered that the differentiation of more than one parental stock into diverse products is a contemporaneous process. Any further statement of the essential facts in the last connection must await the preparation of the complete account of the Moorean species, including the details of their distribution and the quantitative data of their variation.

The purpose of the present article is to place on record certain new species that are so noteworthy as to merit immediate attention. The general point of greatest interest is that they were unknown to Garrett, who resided many years in the Society Islands, and whose circumstantial account of the land gastropods of that group[1] reveals his intimate knowledge of the organisms and of their localized situations. Garrett's descriptions of the Moorean snails show that he explored the island with great care, yet the new species herein described must have escaped his notice on account of the peculiar circumstances of their occurrence. Having corroborated the records of the species of Tahiti, Raiatea, Tahaa, Huaheine, and Borabora, it was a real surprise to the present author to find novel forms in Moorea which are not mentioned in the literature, and which are entirely absent from the extensive collections made by Garrett, now distributed in the museums of Honolulu, Philadelphia, Washington, Cambridge, and Pittsburg.

Three of the new species are sinistral, thus agreeing with *P. mooreana*, which is dextral only in the case of rare, newly-discovered mutations, and also with numerous local associations of *P. suturalis*. Hence the island of Moorea supports more reversed species of the genus than are known to occur elsewhere throughout its entire range. The fourth novel species is predominately dextral, although exceedingly rare sinistral mutants have been found.

PARTULA TOHIVEANA, new species. Plate VI, figures 1–4.

Shell large, sinistral, elongate-conic, and perforate. Whorls 5 to 5½, with flattened profile at the apex, becoming more convex with further growth; suture slightly impressed in most ex-

[1] Journ. Acad. Nat. Sciences, Philadelphia, Vol. IX, part I, 1884.

amples. The middle area of the last whorl is flattened or even indented immediately outside of the lip. Columella straight. The dense, finely-sculptured lines of the younger whorls disappear toward the body-whorl which is therefore smooth and shining in undecorticated specimens.

Aperture elongated, with its long axis inclined away from the columellar axis. Lip rounded or slightly beveled, thickened inwardly, sharply angled at the columellar insertion, and dentated near its outer insertion; the toothed appearance is accentuated by the sudden narrowing of the outer peristome toward its junction with the last whorl. A thin, shining callus spreads over the body-whorl between the two insertions of the lip. A parietal tooth is well developed almost universally.

Colors: (*a*) corneous yellow or light corneous-brown, with or without darker coloring of the apical whorls, and in some specimens with sparse darker transverse lines (Plate VI, fig. 1); (*b*) similar in ground color and with two, sometimes four, vaguely-defined revolving bands of chocolate-brown (Plate VI, figs. 2, 3); (*c*) with a revolving median zone of chocolate-brown upon the usual background (Plate VI, fig. 4). The lip is white, smooth, and shining.

The shells of half-grown individuals have the outer wall plainly angled, although this feature disappears on the later-formed whorls. The embryonic young are always unbanded, either white or faintly corneous, with or without a colored tip. The bands of fasciated adults appear only in post-embryonic life, and they seem to be relics of an antecedent dark general color. Embryonic capsule impregnated with calcareous substance so as to be opaque.

Dimensions as follows:

Length 17.4–23.7 mm., average 21.68 mm.

Width 10.1–13.7 mm., average 12.08 mm.

Length of aperture 8.9–12.5 mm., average 11.06 mm.

Width of aperture 6.7–9.3 mm., average 7.98 mm.

Proportions of shell 49.5–60.5 per cent, average 55.65 per cent.

Proportions of aperture 65.5–78.5 per cent, average 72.04 per cent.

Proportions of aperture-length to shell-length 47.5–55.5 per cent, average 50.95 per cent.

Habitat: Moorea, Society Islands; lower slopes of Mt. Tohivea.

This species presents several features of special interest. In the first place, in the writer's experience it exists only in a very limited area of bush on the lower northern slopes of Mt. Tohivea, which is the dominating mountain of the island. In July of 1923 a few hundred specimens of various ages were taken in an area not more than four hundred yards in lateral extent, between 700 feet and 900 feet above sea level. Despite the fact that the natives of Moorea, as elsewhere in the Society Islands, are collectors of shells to be made into necklaces and wreaths, the new species was entirely unknown to them.

Intrinsic noteworthy features are the roundly dentated outer lip, and the simple conical contour of the youngest whorls, in which characters *P. tohiveana* resembles the dextral species *P. dentifera* and *P. formosa* that live in the island of Raiatea, more than a hundred miles to the west-northwest of Moorea. The resemblances in these distinctive qualities suggest that the Moorea and Raiatea forms displaying them are descended from a common ancestral stock, comprising animals of both coils like *P. otaheitana* and *P. suturalis* as they exist today, and which ranged over a larger body of land connecting the two islands in former ages. At the northwestern end of this former land, where Raiatea remains, the present derivatives have retained the dextral coil, while at the eastern end, which is now the separated island of Moorea, the animals are reversed. Under the geographic and other circumstances, *P. tohiveana* cannot be a direct product of Raiatean ancestry; and it is equally clear that the Raiatea species with the characteristics in question are not the descendants of direct migrants from Moorea.

Partula olympia, new species. Plate VI, figures 5–8.

Shell sinistral, ovate-conic, more compact than in *P. tohiveana;* compressly perforate. Whorls 5 to 5¼, convex throughout, suture of the body-whorl impressed. The middle part of the last whorl is depressed just before it meets the flaring lip,

as in *tohiveana*. Columella twisted slightly,—a feature more evident in adolescent than in adult shells. The spiral sculpturing continues from the youngest whorls to the very edge of the lip.

Aperture elliptical, axis parallel to the columellar axis. Lip rounded or slightly beveled, thickened inwardly, broad at its columellar insertion and narrowed toward its outer insertion, but not so markedly as in *tohiveana*. A shining callus occurs between the two insertions, finely pitted under the lens. A parietal tooth occurs in all but a few of the shells, but it is not prominent.

Colors: (*a*) uniform fleshy corneous; (*b*) uniform medium brown; (*c*) same in basis, with a median band of brown on the whorls of the spire only (Plate VI, fig. 5); (*d*) similar in ground-color, with a vague median band of brown which extends over the body whorl as well as on the upper coils (Plate VI, figs. 6, 7); (*e*) ground color as before, with two revolving bands of brown, weak and vaguely defined (Plate VI, fig. 8). The lip is white.

The outer wall of the adolescent shell displays a median angle. The revolving colors of fasciated individuals appear on the embryonic shell, in which respect they differ from the bands of deeper tint in *tohiveana*. The embryonic capsule is opaque.

Dimensions of thirty-one measurable shells as follows:

Length 17.7–20.4 mm., average 18.94 mm.

Width 10.3–11.9 mm., average 10.99 mm.

Length of aperture 9.1–10.9 mm., average 9.99 mm.

Width of aperture 6.7–8.1 mm., average 7.43 mm.

Proportions of shell 53.5–62.5 per cent, average 58.14 per cent.

Proportions of aperture 70.5–80.5 per cent, average 74.37 per cent.

Proportions of aperture length to shell length 49.5–56.5 per cent, average 53.63 per cent.

Habitat: Moorea, Society Islands: inner slopes of Mt. Mouaputa at high levels.

On first inspection the present species appears to be very close to *P. tohiveana*, but on further study it proves to be clearly dis-

tinct. The two species are alike in sinistral coil, narrowed outer insertion of the lip, depressed median body-whorl outside of the lip, and in the general coloration of certain subordinate classes. But *P. olympia* differs in its more compact form, straighter aperture, convex apical whorls, its delicate sculpturing throughout the whole shell, and in the earliest possible appearance of the revolving bands when they occur. Hence *P. olympia* is no nearer to *tohiveana* than it is to the far more abundant *P. mooreana* of the same island.

Less than a hundred examples of all ages have been taken. They were discovered in 1919 in a restricted area of forest about 900 feet above sea-level, on the inward or northern slopes of Mt. Mouaputa. This mountain stands about two miles from Mt. Tohivea with which it is connected by a portion of the ancient wall of the huge central crater of the island. The forests are virtually continuous between the localities of *olympia* and *tohiveana*, but no sinistral snails belonging to these or to any other species were found in the intervening territory. The natives had never found the type, so far as could be ascertained; the specific name is conferred because they believe that the mountain of Mouaputa is the dwelling-place of invisible supernatural beings.

PARTULA DENDROICA, new species. Plate VI, figures 9–13.

Shell sinistral, oblong-conic, compressly perforate. Whorls $5\frac{1}{4}$ to $5\frac{1}{2}$, slightly convex, the last conspicuously slender. Suture impressed, more markedly on the last whorls. Columella sinuous. Surface shining and generally smooth, as if polished; spiral sculpturing weak, and obsolescent on the last whorl.

Aperture oval, not inclined. Lip rounded, slightly thickened within, channeled at its columellar junction, and evenly curving to the neighborhood of its outer insertion where it turns inward more abruptly. The callus over the body-whorl is very thin. Parietal tooth entirely wanting, or very weakly developed in a small percentage of the specimens.

The color classes are clearly differentiated, as follows: (*a*) uniform light straw-yellow, with slightly darkened tip as a rule

(Plate VI, fig. 9); (*b*) uniform yellowish-brown, or brown (Plate VI, fig. 10); (*c*) yellowish-brown, with a single median band of deep brown, sharply defined on all excepting the youngest of the whorls (Plate VI, fig. 11); (*d*) like the foregoing in ground-color, with a broad median zone of deep brown color (Plate VI, fig. 12); (*e*) yellowish-brown or brown, with four revolving bands of deeper brown, one near the suture, one near the base, and two intermediate (Plate VI, fig. 13).

The metaneanic whorls are not angled as in *tohiveana* and *olympia*. Fasciation begins with the embryonic stages. The embryonic capsule is opaque.

Dimensions of the entire series of adult shells in hand, eighty-six in all, as follows:

Length 18.9–23 4 mm., average 20.45 mm.

Width 10.3–12.5 mm., average 11.29 mm.

Length of aperture 9.9–11.7 mm., average 10.74 mm.

Width of aperture 7.1–8.9 mm., average 8.06 mm.

Proportions of shell 46.5–61.5 per cent, average 55.17 per cent.

Proportions of aperture 66.5–81.5 per cent, average 75.00 per cent.

Proportions of aperture-length to shell-length 46.5–58.5 per cent, average 52.44 per cent.

Habitat: Moorea, Society Islands; southern and southwestern aspects of Mt. Rotui, at high levels.

This species was first discovered in 1909, when it was supposed to be a local variant of *P. suturalis* Pfeiffer, which it resembles in some features. While *P. dendroica* and *P. suturalis* may be connected through a common remote ancestry, there can be no question that the differences they now exhibit justify their separation as distinct species.

Mt. Rotui is a lofty mass of volcanic rock situated between the two bays of Faatoai or Opunohu and Paopao which indent the northern side of Moorea. It is interpretable as a sector of an original crater which has long been disconnected from the semicircle comprising the high peaks of Mt. Tohivea and Mouaputa, where the previously-described species occur. The areas where *P. dendroica* was found lie in a zone of dense vegetation

on the abrupt southern slopes of Mt. Rotui. The snails live on the high shrubs and trees, and are rarely taken on the plants of lower growth where *P. tæniata* and other species are found. The specific name is given on account of the tree-dwelling habits of the species. Probably the habits in question and the local occurrence of the species are responsible for Garrett's failure to discover *dendroica*.

From seven points within the inhabited area, representative collections have been secured which comprise more than two hundred individuals of adult and adolescent growth. The several associations differ much as regards the number *and* relative frequencies of their component color-classes. In brief, *P. dendroica* surpasses *P. tohiveana* and *P. olympia* in its geographical extension and in its local differentiation, although it falls far short of the other species of Moorea in both of these respects.

PARTULA MIRABILIS, new species. Plate VI, figures 14–20.

Shell dextral (reversed in rare mutations); ovate-conic to elongate-conic, openly or compressly perforate. Whorls 5, slightly convex, the body-whorl flattened toward the lip; suture of the last whorl impressed. The surface is sculptured throughout, but the lines are fewer on the larger whorls, which are shining and generally smooth except in decorticated specimens.

Aperture narrowed, elongated, almost oblong in general outline. Lip sharply beveled, thin, and smooth. A thin, roughened callus spreads between the insertions of the lip. Parietal tooth present in almost all instances, but it is seldom prominent.

Colors: (*a*) corneous fleshy, apex pale brown (Plate VI, fig. 14); (*b*) pale brown, with deeper brown transverse strigations (Plate VI, fig. 15), (*c*) corneous brown, with darker brown, ruddy, or rose-brown spire; (*d*) deep chocolate brown or seal brown, the spire usually lighter (Plate VI, fig. 16); (*e*) light brown, with three revolving bands of deeper brown color, and usually with sutural and basal clouding (Plate VI, fig. 17); (*f*) encircled by a broad zone of deep brown color, which is separated from the brown sutural and basal areas by narrow corneous lines, often with an asymetrical revolving corneous line through

the median line itself (Plate VI, fig. 18); (*g*) deep seal-brown in general, with a revolving corneous zone toward the base and just within the suture of the upper whorls (Plate VI, fig. 19); (*h*) brown, save for a median revolving area which is corneous (Plate VI, fig. 20). The lip is white in the lighter-colored classes, and stained with brown or purplish-brown in the darker divisions.

Embryonic young are either brown of various shades, or they are clearly girdled by a central zone of darker color; the latter condition develops into the several forms of final adult fasciation. The egg capsule is opaque.

Dimensions are here given as the extreme measures of the few hundred shells already analyzed, as follows:

Length 14.1–18.6 mm.

Width 8.3–10.7 mm.

Length of aperture 7.5–10.1 mm.

Width of aperture 5.1–7.1 mm.

Proportions of shell 51.5–65.5 per cent.

Proportions of aperture 61.5–79.5 per cent.

Proportions of aperture length to shell length 46.5–59.5 per cent.

Habitat: Moorea, Society Islands: several subordinate localities within the central crater valley of Opunohu, and in some adjacent areas.

This species receives its name in recognition of certain remarkable features of its intrinsic nature and distribution. In the first connection, the notable point is its striking differentiation in the characteristics of coloration; no less than eight color-classes can be distinguished, and some of these are not duplicated in any other species of the Society Islands. These color-classes vary in number and relative abundance in the several local associations, which therefore present very different aspects even in neighboring valleys. The aperture is exceptionally narrow for a species of *Partula*, while the beveled nature of the lip is another distinctive feature.

It seems certain that Garrett possessed no examples of this species, for nothing of the kind is mentioned in his writings or in his correspondence with Hartman and others, and the species

is entirely lacking in the abundant series of shells sent by Garrett to conchologists. Yet at the present time the total area of its occupation extends over some miles of territory, in which the animals occur in greater numbers at the higher levels. From the observations of the present writer during the years from 1907 to 1923, it is certain that the species has spread into this wider territory from a central region that must have been so small in Garrett's time as to escape the scrutiny of that careful explorer and observer; in short, the condition of *P. mirabilis* some decades ago must have been like that of *P. tohiveana* and *P. olympia* at the present time, although *mirabilis* has extended its range and it has differentiated into diverse colonial associations as the other species have not as yet.

The full statement of the structural qualities and color-characteristics of *mirabilis* must await the complete analysis of the material now in hand, which comprises several thousand individuals. The data given in the foregoing account sufficiently define the species and indicate its noteworthy features.

Explanation of Plate VI

Figs. 1–4. *Partula tohiveana*, new species.
Figs. 5–8. *Partula olympia*, new species.
Figs. 9–13. *Partula dendroica*, new species.
Figs. 14–20. *Partula mirabilis*, new species.

A BUCKET DREDGE

BY CHARLES HEDLEY

I suppose that all zoologists who have worked in water deeper than a hundred fathoms have found trouble with their gear. Especially is this the case with people who, like myself, began to dredge without tuition or any help from experienced men. Sometimes a dredge returns without a spoonful of shells, although the polished metal certifies that it has been rubbed on the bottom. A dredge that goes overboard so neatly may return with the tail wrapped in the mouth or the wire rope may be twisted and tangled.

After many such disappointments, the writer planned to construct a fool-proof dredge, which should never fail to go down straight, to fill properly and finally to deliver a profitable load on deck. The instrument here described has fulfilled these requirements, working admirably in rough, very rough, weather.

Fig. 1

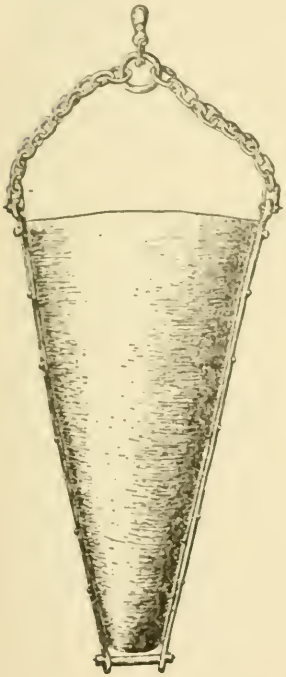
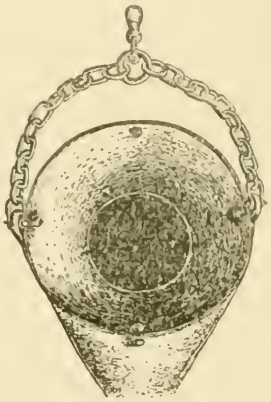


Fig. 2



Figs. 1, 2. Bucket Dredge, from the side and above.

Several American friends to whom I related my experiences have asked for particulars. In the hope that the usefulness of this tool may be extended, I now offer to the readers of the "Nautilus" a sketch and description of my bucket dredge.

The dredge, which weighs altogether about forty pounds, is made of a sheet of 2-mm. steel rolled in a cone, 1000 mm. long, 410 mm. in diameter at the wide end and 100 mm. at the narrow end. This cone is stiffened by side straps of flat bar steel 7 mm. thick and 40 mm. wide. These project 50 mm. beyond

the small end to hold a 12-mm. bolt; outside this bolt and between the side straps is a "distance piece" which serves the double purpose of holding the side straps apart and of carrying a dredge or tangles. At the wide end the side straps project 50 mm. and are thickened into 18-mm. shoulders in order to carry the shackle bolt. A substantial chain attached to the latter serves to swing the dredge. The aperture of the dredge is choked with a cone-shaped flange, a moveable basin diaphragm, with an orifice of 200 mm. in diameter and set back 120 mm. within the periphery. By the rim it is fastened to the dredge with four nuts and bolts. The object of the flange is to save the contents from being washed out by swirling eddies as the dredge ascends.

One point that I stress for the zoologist, who is not an engineer, is the need for a strong swivel-link to be placed above the bucket. A bucket sent down to deep water without a swivel will not come home but will spin till the rope screws off and breaks.

For emptying the dredge the flange is removed and the sand or mud dug out with a trowel, the contents may be bagged up to take ashore. But if the voyage is a long one the catch can be treated aboard. For this I carry sieves small enough to be manipulated in an ordinary ship's bucket. These are 200 mm. in diameter, 100 mm. deep and have a wire net of 20 meshes to the inch. Finally when the mud is washed out, the product of the sieves can be tied up in small canvas bags, holding a couple of pounds or so, and dried in the engine room.

NOTES ON MARINE MOLLUSKS FROM PERU AND ECUADOR

BY A. A. OLSSON

In the course of geologic studies in Peru, opportunity was occasionally found for the collection of marine mollusks from the beaches along the northwest coast. Although these collections have not as yet been fully studied, it is believed that this preliminary account and list of the more common or otherwise interesting species may be of value. The collections begin

to the south at Bayover on the south side of the Bay of Sechura and continue northward nearly to the mouth of the Tumbez river. Collections were also made at several localities on the Santa Elena peninsula of Ecuador and are included. Dall's excellent Checklist of the Peruvian Marine Mollusks has been most useful as an aid in the identification and as a guide during collecting. To this list, can be added several species and definite Peruvian locality records for several more. Species not previously known from Peruvian localities are indicated with a *.

Most of the shells contained in the collections belong to species characteristic of the Panaman faunal province, whose southern limit and border with the Peruvian province, has been variously placed as the Gulf of Guayaquil, Paita and Punta Aguja. No sharp and fast line can of course be drawn and, in the general border region of the two provinces, a certain intermingling and overlapping of the two faunas will occur. Apparently, it would seem that Punta Parinas, the most westerly point of the South-American continent, forms the most natural line that can be drawn between the two provinces, although many of the Panaman species extend beyond into the warm, protected bays of Paita and Sechura. It is at or near Punta Parinas, where the cold Peruvian or Humboldt current finally leaves the coast in a more westerly swing out into the open Pacific. The rather large list of marine mollusks collected at Negritos (near Parinas) is the result of very persistent collecting during several months of residence and does not represent the usual species found each day on the beach. The common fauna of Parinas is rather a limited one, in which the *Tivela planulata* Broderip and Sowerby, is the most common and characteristic species. Among the seaweed-covered rocks exposed at low tide, are found in abundance, the *Thais biserialis* Blainville, *T. peruensis* Dall, *T. chocolata* Duclos, many Chitons, Acmaeas and an occasional *Turbo magnificus* Jonas, and *Acanthina muricata* Broderip. Going north up the coast from Parinas, we can note a progressive warming of the waters with shells becoming continually more abundant and varied. Lobitos about 15 miles north of Parinas, generally offers good

collecting and at Restin and Punta Cabo Blanco still further north, mollusks have become quite abundant.

The abundance and varied character of the molluscan fauna in any locality, depends very largely upon the nature of the coast line. A long stretch of sandy beach such as that which extends south from Punta Parinas to the mouth of the Chira river, is generally devoid of much interest. Such beaches in northwestern Peru are characterized by the abundance of a few species, such as *Tivela planulata* Broderip and Sowerby, *Donax punctatostriatus* Hanley, *Olivella columellaris* Sowerby and rare shells of *Periploma planiuscula* Sowerby, *Lima pacifica* Orbigny, *Raeta undulata* Gould and *Pyrula decussata* Wood. A coast bordered by submerged rocks and ledges, as a rule offers the most favorable places for collecting. The wholly or partially submerged rocks support a large fauna mainly of gastropods; while shell-drift often very rich in the smaller and less known species, is allowed to accumulate along the sandy beaches. The coast of the Santa Elena peninsula at Salinas, is of this kind, the scene of some of the early collecting of Cuming and the type locality for many species.

Many interesting species were collected from old Indian graves which are found abundantly along certain parts of the Peruvian coast. These Indian graves are generally thickly covered with shells which for the most part, belong to the common species of the coast. Occasionally however many interesting species may be found, which are very rare on the present beaches. They include such shells as the various species of *Cancellaria*, the *Northia northiae* Gray, *Solenosteira anomala* Reeve and *Thais kiosquiformis* Duclos.

The localities represented by the collections are the following.

Ecuador: On the Santa Elena peninsula, at Salinas, Colonche and Playas.

Peru: North, Mal Paso to Zorritos. Zorritos to Boca de Pan. Mancora to Punta Verde. Punta Cabo Blanco. Lobitos. Negritos (Parinas). Paita. Bayover (Bay of Sechura).

Bullaria aspersa A. Adams. Negritos, Lobitos, Mancora. Salinas.

**Umbraculum* sp. A broken specimen which measured fully

75 mm. in length when complete was collected at Mancora. It is probably the *U. ovalis* Carpenter of the Bay of Panama.

Terebra strigata Sowerby. Common, Paita, Negritos, Lobitos, Mancora, Salinas.

Conus monilifer Sowerby. Lobitos.

Conus purpurascens Broderip. Mancora.

Cancellaria cassidiformis Sowerby. Common on Indian graves near Negritos, Que. Mancora; living at Mancora.

Cancellaria chrysostoma Sowerby. Locally common, Negritos, Lobitos, Mancora, Salinas.

**Cancellaria cumingiana* Petit. Often common on Indian graves. Living at Lobitos and Mancora.

Cancellaria clavatula Sowerby. Lobitos.

Cancellaria obesa Sowerby. Indian graves, Mancora.

Cancellaria tessclata Sowerby. Mancora.

Oliva angulata Lamarck. Zorritos.

Oliva kaleontina Duclos. Negritos, Lobitos, Mancora.

Oliva peruviana Lamarck. Negritos, Lobitos, Mancora, 1 specimen at Salinas.

Oliva spicata Bolton var. *pindarina* Duclos. Salinas.

Olivella columellaris Sowerby. Very common along the entire northwest coast, Salinas.

Olivella semistriata Gray. Zorritos.

Marginella curta Sowerby. Paita, Negritos, Lobitos, Mancora, Zorritos, Salinas.

**Vasum caestus* Broderip. Rare, Negritos.

Solenosteira fusiformis Blainville. Negritos, Lobitos, Salinas. Also on Indian graves near Mancora.

**Solenosteira anomala* Reeve. From Indian graves between Mancora and Punta Sal.

**Cantharus distortus* Gray. Common, Negritos, Mancora, Zorritos, Salinas.

Cantharus elegans Gray. Lobitos, Mancora, Zorritos, Salinas.

**Cantharus gemmatus* Reeve. Lobitos, Mancora, Salinas.

**Cantharus ringens* Reeve. Lobitos, Mancora, Salinas.

**Engina contracta* Reeve. Negritos.

**Northia northiae* Gray. From Indian graves near Mancora.

**Leucozonia cingulata* Wood. Mancora, Salinas.

Columbella fuscata Sowerby. Lobitos, Mancora.

Columbella major Sowerby. Lobitos, Mancora, Salinas.

Columbella paytensis Lesson. Lobitos, Mancora, Salinas.

Columbella strombiformis Lamarck. Salinas.

Anachis fluctuata Sowerby. Mancora.

**Strombina recurva* Sowerby. Lobitos, Mancora, Salinas.

**Murex nigrescens* Sowerby. Mancora, Salinas.

**Eupleura muriciformis* Broderip. Negritos, Lobitos.

Thais biserialis Blainville. Common, Paita, Negritos, Lobitos, Mancora, Salinas.

Thais callaoensis Gray. Negritos, Lobitos, Mancora, Salinas.

Thais chocolata Duclos. Negritos, Lobitos.

Thais crassa Blainville. Salinas.

Thais kiosquiformis Duclos. Indian graves near Mancora, Colonche (common).

Thais peruensis Dall. Negritos, Lobitos.

Thais triangularis Blainville. Mancora living and on Indian graves, Salinas.

Acanthina brevidentata Mawe. Negritos, Lobitos, Mancora, Salinas.

**Acanthina muricata* Broderip. Negritos, Lobitos, Mancora, Salinas.

**Distortio constrictus* Broderip. Negritos, Lobitos, Mancora, Salinas.

**Cymatium gibbosum* Broderip. Negritos, Lobitos, Mancora.

**Cymatium lignarium* Broderip. Negritos, Mancora, Salinas.

Bursa sp. My specimens are all broken but they appear closest to the *B. rugosa* Sowerby from Manila, according to Sowerby's figure (Con. Ill., fig. 7).

**Cassidea abbreviata* Lamark. Lobitos, Mancora, Salinas.

Malea ringens Swainson, Occasional, Bayover, Negritos, Lobitos, Mancora, Salinas.

**Pyrula decussata* Wood. Negritos, Lobitos, Zorritos.

**Simnia rufa* Sowerby. Negritos.

**Cyphoma emarginata* Sowerby. Negritos, Mancora.

**Levenia coarctata* Gray. Mancora, Salinas.

**Morum tuberculosum* Sowerby. Mancora.

Cypraea annettae Dall. Negritos, Lobitos, Mancora, Zorritos.

Cypraea arabicula Lamarck. Lobitos, Mancora, Salinas.

Cypraea exanthema Linnaeus. Occasional along the whole coast.

Cypraea nigropunctata Gray. Lobitos.

Trivia pacifica Gray. Salinas.

Trivia radians Lamarck. Common, Negritos, Lobitos, Mancora, Salinas.

**Trivia sanguinea* Gray. Negritos, Lobitos, Mancora, Salinas.

Erato scabriuscula Gray. Mancora.

Cerithium adustum Kiener. Salinas.

Cerithium maculosum Kiener. Salinas.

Serpulorbis squamigerus Carpenter. Lebitos, Salinas.

Turritella goniostoma Valenciennes. Generally common, Bayover, Paita, Negritos, Lobitos, Mancora, Salinas.

Architectonica granulata Lamark. Generally large and common, Negritos, Lobitos, Mancora.

Cheilea equestris Linnaeus. Salinas.

Calyptraea mamillaris Broderip. Salinas.

Crucibulum imbricatum Sowerby. This and the next are very common species along the Peruvian coast. Bayover, Paita, Negritos, Lobitos, Mancora, Salinas.

Crucibulum spinosum Sowerby. Same localities as the last.

Crepidula aculeata Gmelin. Very common along the entire coast.

Crepidula crepidula Linnaeus. Zorritos.

Crepidula incurva Broderip. Lobitos, Mancora.

Crepidula onyx Sowerby. Salinas.

Crepidula squama Broderip. Negritos, Lobitos, Mancora, Salinas.

Hipponix barbata Sowerby. Salinas.

**Natica broderipiana* Reclus. Negritos, Lobitos, Zorritos, Salinas.

Natica elenae Reclus. 1 specimen from Salinas.

Natica unifasciata Lamarck. Colonche.

Polinices uber Valenciennes. On Indian graves and living along the coast, Paita, Negritos, Lobitos, Salinas.

Polinices cora Orbigny ? Negritos.

Neverita glauca Humboldt. Negritos, Lobitos.

Sinum concavum Lamarck. Negritos, Mancora.

Sinum n. sp. This species belongs to the group of *S. perspectivus* Say, but is somewhat less depressed. From *S. debilis* Gould they differ in being larger, slightly less depressed, a smaller mouth and a little, higher spire. The nucleus is stained brown. I have specimens from Panama (Bucaru) and from Salinas, Ecuador.

Turbo magnificus Jonas. Bayover, Negritos, Lobitos.

Turbo (*Callopoma*) *saxosus* Wood. Salinas.

Astraea (*Uvanilla*) *buschii* Philippi. Zorritos, Salinas.

Tegula melaleuca Jonas. Lobitos.

Tegula panamensis Philippi. Lobitos.

Tegula smithii Tapparone-Canefri. Lobitos.

**Tegula viridula* Gmelin. Mancora.

Calliostoma fonkii Philippi. Negritos, Lobitos, Mancora, Salinas.

Fissurella crassa Lamarck. Negritos.

Fissurella (*Cremides*) *asperella* Sowerby. Negritos, Lobitos.

Fissurella (*Cremides*) *virescens* Sowerby. Salinas.

Fissuridea alta C. B. Adams. Negritos.

Fissuridea inaequalis Sowerby. Negritos, Lobitos, Zorritos.

Nucula exigua Sowerby. Common at Salinas.

Leda elenensis Sowerby. Common at Salinas.

**Leda* (*Adrana*) *crenifera* Sowerby? Mancora, Boca de Pan, Salinas.

Arca pacifica Sowerby. Negritos, Lobitos, Zorritos, Salinas.

Arca lithodomus Sowerby. 1 small, right valve was sorted out of shell-drift collected at Salinas.

Arca (*Noetia*) *reversa* Sowerby. Mancora, quite common at Zorritos, Salinas.

**Arca* (*Noetia*) *olssoni* Sheldon and Maury. Negritos, Salinas. The Peruvian specimens are somewhat larger than the Panama examples.

**Arca* (*Barbatia*) *lurida* Sowerby. A single left valve was collected at each of the following localities: Zorritos, Salinas. The type specimen was collected by Cuming from Santa Elena, probably in the vicinity of Salinas.

Arca (*Barbatia*) *reevcana* Orbigny. Quite typical examples. Lobitos, Zorritos, Salinas.

**Arca (Barbatia) reevcana* var. *lasperlensis* Sheldon and Maury. Several specimens, Zorritos, Salinas.

Arca (Barbatia) gradata Broderip and Sowerby. Negritos, Lobitos, Salinas.

**Arca (Barbatia) illota* Sowerby. Lobitos, Salinas.

Arca (Barbatia) solida Sowerby. Negritos, Lobitos, Salinas.

**Arca (Scapharca) emarginata* Sowerby. Paita, Negritos, Zorritos.

Arca (Scapharca) aviculoides Reeve. Salinas.

Arca (Scapharca) tuberculosa Sowerby. Very common along the entire coast and much used for food.

**Arca (Scapharca) obesa* Sowerby. Negritos, Zorritos, Salinas.

Arca (Scapharca) formosa Sowerby. Not common, Salinas, Zorritos.

Arca (Scapharca) grandis Broderip and Sowerby. Very common as a Pleistocene fossil in the Peruvian tablazos. Zorritos.

**Arca (Scapharca) nux* Sowerby. Common, Negritos, Lobitos, Zorritos, Salinas.

**Arca (Scapharca) aequatorialis* Orbigny. Zorritos.

Arca (Scapharca) labiata Sowerby. Colonche, rare on Indian mounds in Que. Seca.

Glycymeris chemnitzii Dall. Salinas.

Glycymeris inaequalis Sowerby. Bayover, Negritos, Lobitos, Mancora, Zorritos, Salinas.

**Glycymeris maculata* Broderip. Zorritos.

Pinna sp. Fragments of a large species from Bayover.

Pteria peruviana Reeve. The shells of the Peruvian Pearl Oyster are at times found in considerable abundance on the beach at Negritos. They were also common at Boca de Pan. Shells were also collected at Paita and Salinas.

Ostrea columbiensis Hanley. Jorritos.

Ostrea megodon Hanley. Paita, Negritos, Lobitos. This is a very common Pleistocene fossil in the Peruvian tablazos.

Pecten dentatus Sowerby. Lobitos, Salinas.

Pecten purpuratus Lamarck. Bayover, a common Pleistocene fossil.

**Pecten subnodosus* Sowerby. Negritos, Mancora, Salinas.

Pecten tumbezensis Orbigny. Paita, Negritos, Lobitos, Jorritos, Salinas.

Pecten ventricosus Sowerby. Negritos, Lobitos, Mancora, Zorritos, Salinas.

**Spondylus crassisquama* Lamarck. Negritos, frequently dug up from Indian graves.

Lima pacifica Orbigny. Negritos, Lobitos, Mancora.

Anomia adamas Gray. Common, Paita, Negritos, Lobitos, Mancora.

Anomia peruviana Orbigny. Somewhat less common than the last, Paita, Negritos, Lobitos. The *Placunanomia cumingii* Broderip occurs rarely as a Pleistocene fossil in the Peruvian tablazos, so that it is probably living along the present coast.

**Periploma planiuscula* Sowerby. Negritos, Lobitos, Mancora.

Cyathdonta undulata Conrad. Typical right valve was collected at Salinas.

**Cyathodonta* sp. Several broken specimens of another species were collected at Boca de Pan. In this species the concentric undulations become obsolete ventrally. The submicroscopic radial pustules seen on the surface of *undulata* are lacking.

Crassatellites gibbosus Sowerby. Mancora, Zorritos, Salinas.

**Carditamera radiata* Sowerby. Negritos, Mancora, Zorritos, Salinas.

**Venericardia cuvieri* Broderip. A right and a left valve belonging to 2 individuals were collected on the beach near Zorritos. The larger, a right valve measures, height 62 mm., length 66 mm.

**Chama corrugata* Broderip. Negritos.

Phacoides fenestratus Hinds. Salinas.

**Codakia galapagana* Dall. Boca de Pan, Zorritos, Salinas.

**Divaricella eburnea* Reeve. Mancora, Salinas.

Cardium senticosum Sowerby. Fairly common, Negritos, Lobitos, Mancora, Zorritos, Salinas.

Cardium procerum Sowerby. Common, Negritos, Lobitos, Mancora, Zorritos, Salinas.

**Cardium graniferum* Broderip and Sowerby. Zorritos, Salinas.

Cardium obovale Sowerby. Salinas.

Cardium magnificum Deshayes. Mancora, Zorritos, Salinas.

**Cardium aspersum* Sowerby. Lobitos, Mancora, Salinas.

Cardium clenense Sowerby. Salinas.

Dosinia dunkeri Philippi. Zorritos.

Tivela planulata Broderip and Sowerby. This is one of the most common shells on the beach at Lobitos and Negritos. It becomes very rare further north.

Macrocallista aurantiaca Sowerby. Salinas.

Macrocallista pannosa Sowerby. Boca de Pan.

Macrocallista squalida Sowerby. Salinas, Mancora.

Pitaria circinata Born. Mancora, Salinas.

Pitaria concinna Sowerby. Rather common, Negritos, Lobitos, Zorritos, Salinas.

Pitaria lupanaria Lesson. Quite common, Negritos, Lobitos, Mancora, Zorritos, Salinas.

**Antigona multicostata* Sowerby. Punta Verde, Salinas.

Chione compta Broderip. Quite common at Bayover, a common Pleistocene fossil.

Chione gnidia Broderip and Sowerby. Salinas.

**Chione amathusia* Philippi. Mancora, Zorritos, Salinas.

Chione (*Timoclea*) *asperrima* Sowerby. Colonche, Salinas.

Chione (*Timoclea*) *columbiensis* Sowerby. Rather common, Negritos, Lobitos, Mancora, Zorritos.

Anomalocardia subrugosa Sowerby. Bayover.

Venerupsis oblonga Lamarck. Common, Paita, Negritos, Lobitos.

Tellina crystallina Wood. Salinas, fine large specimens.

Tellina rubescens Hamley. Salinas.

**Macoma aurora* Hamley. Boca de Pan, Salinas.

Metis excavata Sowerby. Mancora, Salinas.

Semele corrugata Sowerby. Bayover, Negritos, Lobitos, Mancora.

**Semele lenticularis* Sowerby. Mancora, Salinas.

**Semele proxima* C. B. Adams. Negritos, Lobitos, Zorritos.

Cumingia lamellosa Sowerby. Lobitos.

Cumingia mutica Sowerby. Boca de Pan.

Sanguinolaria hanleyi Bertin. Lobitos, Mancora, Salinas.

Tagelus dombeyi Lamarck. Bayover, Paita, Negritos.

**Tagelus?* This may be the *Solecurtus violaccus* Sowerby. It

is occasionally fairly abundant on certain parts of the beach at Negritos.

**Donax gracillis* Hanley. Negritos, Lobitos, Zorritos, Salinas.

Donax punctatostriatus Hanley. Very common on all sandy beaches. Paita, Negritos, Zorritos, Salinas.

Iphigenia altior Sowerby. Salinas, Colonche.

Mactra (*Mactrotoma*) *velata* Philippi. Rather common, Paita, Bayover, Negritos, Lobitos, etc., Salinas.

**Mactra* (*Mactrotoma*) *augusta* Deshayes. Rare, Zorritos, Salinas.

Mactra (*Mactrotoma*) *californica* Conrad. Fairly common at Salinas.

Mactra (*Mactrella*) *clisea* Dall. 1 specimen from Salinas.

**Mactra* (*Mactrella*) *exoleta* Gray. Boca de Pan, Playas.

**Mactra* (*Mactrella*) *elegans* Sowerby. Rare, Zorritos, Playas, Salinas.

Mulinia pallida Broderip and Sowerby. Common, Paita, Negritos, Lobitos, etc., Salinas.

**Labiosa* (*Raeta*) *undulata* Gould. Occasional on the beach but generally broken. Negritos, Lobitos, Mancora.

**Cryptomya californica* Conrad. Paita, Negritos (fairly common), Lobitos, Salinas.

Pholas chiloensis Molina. Paita, Negritos, Lobitos.

Barnea pacifica Stearns. Paita, Lobitos.

A NEW ZONITID SNAIL FROM SOUTHERN CALIFORNIA

BY S. STILLMAN BERRY, REDLANDS, CALIFORNIA

Several years ago Mr. George Willett sent me a single specimen of a small land snail of the group now known as *Polita*, which did not appear referable to any of the western species hitherto named. Since then enough additional material has come to hand from collections by Mr. Willett and by Mr. and Mrs. Emery P. Chace so that it seems fairly safe to describe it.

Polita gabrielina new species. Fig. 3.

Description: Shell small, thin, whitish horn color, translucent. Whorls 4½ to 5, regularly enlarging, smooth, except

for the very weak and indistinct incremental lines; surface highly polished, with a waxy luster. Suture distinct, slightly impressed; spire scarcely elevated; base convex, umbilicate, the umbilicus narrow, being contained in the adult shell diameter

FIG. 3. *Polita gabrielina*, new species.

about $8\frac{1}{2}$ to $9\frac{1}{2}$ times, but deep and permeable; periphery smoothly rounded. Aperture oval, oblique, very slightly descending, the lip sharp and only a little reflected at the umbilicus.

MEASUREMENTS.

	Above Camp Baldy	Camp Estelle		
		Type	Paratype	Paratype
	mm.	mm.	mm.	mm.
Greater diameter	4.8	4.3	3.6	3.2
Lesser diameter	4.4	4.0	3.2	2.9
Altitude	2.5	2.2	2.0	1.7
Diameter umbilicus . . .	0.5	0.5	0.36	0.43
Number of whorls . .	5	$4\frac{1}{2}$	$4\frac{1}{2}$	4

Type: Cat. No. 5033 Berry Collection; paratype in collection of Academy of Natural Sciences of Philadelphia.

Type locality; Alt. 5,100–5,200 ft., near Camp Estelle, Upper San Antonio Canyon, San Gabriel Mountains, California; E. P. and E. M. Chace, June 2, 1920; 3 specimens.

Additional localities: Specimens of the same species are before me from other localities as follows:

Alt. 5,500 ft., Icehouse Canyon, San Gabriel Mts., California (from a wood rat's nest); George Willett, Oct. 3, 1918; 1 dead shell.

Above Camp Baldy, San Antonio Canyon, San Gabriel Mts., California; E. P. and E. M. Chace, 1919; 1 dead shell.

Bear Canyon, San Gabriel Mts., California; E. P. and E. M. Chace, June, 1920; 1 specimen.

Alt. 3,200 ft., Glenn Ranch, North Fork of Lytle Creek, San Gabriel Mts., California; E. P. Chace, Dec. 27, 1920; two living specimens.

Remarks: The western Politas are so little understood, and even those already named so incompletely worked out in the literature, that it becomes a matter of no small difficulty to allocate new material satisfactorily. Before venturing to apply a new name to the present specimens therefore, I have been at no small pains to compare them directly with either specimens or available published descriptions of all the other western species of the genus known to me. In the case of such conspicuously diverse species as *indentata* (Say), *binneyana* (Morse), *diegoensis* (Hemphill), *shepardi* (Hemphill), and *chersinella* (Dall),—this last perhaps only doubtfully a *Polita*,—no special keenness of discrimination seems required, but the remaining species have given a little more trouble. I would not have been surprised to find the Sierran *whitneyi* (Newcomb) fairly near, but this is said to be "smoky horn color" and to have a wide "perspective umbilicus" similar to that of *Gonyodiscus striatellus*. From the little *P. johnsoni* (Dall) of the Puget Sound region, our specimens differ both in their immensely larger size and their perforate umbilicus. *Subrupicola* (Dall) and the similar *spelaea* (Dall) are also possible near relations, but throughout are compared by their author to *indentata*, to which they are said to be "precisely similar" in umbilical characters, a statement which could hardly be made of the present species.

The station of *P. gabrielina* is peculiar, as the species has thus far been discovered only among loosely piled debris in quite dry situations; altogether different from those sought by most other Southern California mountain snails, and no other mollusks have yet been noted in association with it. For a *Polita* it is a very pretty species, its pale hue and waxen polish adding much to its attractiveness.

A NEW ALASKAN PUNCTURELLA

BY WM. H. DALL

PUNCTURELLA EYERDAMI, new species.

Shell small, conic, elevated, whitish, the apex recurved with the foramen somewhat in front of it; apart from the apical curve the anterior and posterior slopes are about equal, the anterior slightly convex, the posterior straight; from the apex radiate faintly elevated lines to the basal margin which they do not crenulate; between these are numerous radiating rows of minute punctures, which in combination with the moderately conspicuous incremental rugosities give the surface a sagrinate appearance under the lens. The basal outline is evenly oval, the interior polished white, the septum reaching about one third of the way toward the base, without props. Length, 8; height, 5.5; diameter, 6 mm. U. S. Nat. Mus., Cat. No. 360136.

Drier Bay, off Knight Island, Prince William Sound, Alaska. Walter Eyerdam.

No other punctate species is known from the coast, and this one cannot be mistaken for any other West American form if closely examined.

ON TRIODOPSIS HARFORDIANA W. G. B.

BY H. A. PILSBRY

"*Triodopsis harfordiana* J. G. Cooper" was described and figured by W. G. Binney in Terrestrial Mollusks vol. v, 1878, p. 309, fig. 203. He thought that the species was the same described by J. G. Cooper in 1870 as *Dædalochila harfordiana*, to which he incorrectly refers as "*Helix harfordiana* J. G. Cooper."

In Man. Amer. Land Shells, 1885, p. 114, Binney substituted new figures, drawn from Cooper's type specimen, but reprinted his own former description. Here he called the species *Polygyra harfordiana* J. G. Cooper, and repeated the earlier erroneous reference to Cooper's description. On page 119 he reprinted his 1878 figures of "*Triodopsis harfordiana*"

as one of the (nameless) forms of *Mesodon devius*. This amounted to refering his *description* to one species, his *figures* of the same specimen to another. In 1886, Bull. M. C. Z. XIII, No. 2, p. 37, Binney reclaimed *Triodopsis harfordiana* as a distinct species, giving new description and figures.

Recognizing the distinctness of the two shells named *harfordiana* by Cooper and by Binney, Tryon in September, 1887 (Man. of Conch. III, p. 146), proposed the new name *Helix salmonensis* for *Triodopsis harfordiana* W. G. Binney.

Still later, C. F. Ancey proposed the new name *Helix commutanda* for Binney's *T. harfordiana* (Conchol. Exch. II, December, 1887, p. 79).

The synonymy of these species will therefore stand thus:

POLYGYRELLA (POLYGYROIDEA) HARFORDIANA (J. G. Cooper).

Dædalochila harfordiana J. G. Cooper, Amer. Journ. Conch. V, p. 196, pl. 17, fig. 8.

Helix harfordiana J. G. C., Tryon, Man. Conch. III, 1887, p. 130, pl. 27, figs. 55–57.

Polygyra harfordiana J. G. C., W. G. Binney, Man. Amer. Land Shells, 1885, p. 114, fig. 81, not the description.

Helix (*Polygyrella*) *harfordiana* Cooper, Pilsbry, Proc. A. N. S. Phila., 1890, p. 200, pl. 5, figs. 12, 13, 14. Also reprinted in NAUTILUS V, 1891, p. 40.

Polygyrella harfordiana (J. G. Cooper), Pilsbry, Man. Conch. IX, p. 80

Big Trees, Fresno Co., California, at 6500 feet elevation, W. G. W. Harford.

The unique type of this snail has been figured by the writer. It has been referred to *Polygyrella*, but while it agrees with that genus in texture, general form and unexpanded lip, it differs by lacking internal teeth, and by having a tridentate aperture. The new subgenus *Polygyroidea* is here proposed for it.

This is one of the rarest Californian land shells. It does not appear to have been collected since the original find.

POLYGYRA (TRIODOPSIS) SALMONENSIS (Tryon)

Triodopsis harfordiana J. G. Cooper, W. G. Binney, Terr. Moll. V, 1778, p. 309, fig. 203 (not *Dædalochila harfordiana* J. G. Cooper).

Polygyra harfordiana J. G. Cooper, W. G. Binney, Man.

Amer. Land Shells, 1885, p. 114, description only; not the figures.

Mesodon devius var. W. G. B., op. cit., p. 119, fig. 88.

Triodopsis harfordiana W. G. Binney, Bull. M. C. Z. XIII, pt. 2, p. 37, pl. 1, figs. 6, 7.

Helix salmonensis Tryon, Man. of Conch. III, p. 147 (Sept. 2, 1887).

Helix commutanda Ancey. Conchologists' Exchange, II, p. 79 (December, 1887).

Salmon River Mountains, Idaho, collected by Henry Hemphill.

Binney's figured holotype is no. 11116 A. N. S. P. This specimen becomes also type of *salmonensis* and *commutanda*.

Tryon also proposed the new name *Helix binominata* for *Triodopsis hemphilli* W. G. Binney; but as the latter was not a homonym, as he supposed, that change was superfluous.

INTERESTING FACTS IN THE HISTORY OF UNIO ORBICULATUS HILDRETH AND U. ABRUPTUS SAY

BY L. S. FRIERSON

Under the name of *Unio orbiculatus* Hildreth Dr. R. E. Call minutely described the *Unio abruptus* Say in the Mollusca of Indiana (1900), and figured the latter on plate 50 of the same work. Dr. Call observed (*Ibid.*, p. 493), that Hildreth and the "earlier naturalists" seemed to have considered his species as closely akin to the short and thick variety of the *Unio ligamentinus* Lamarck found in the Ohio.

Notwithstanding that perhaps almost every student of the North American naiades would agree with the above, there are involved in it no less than three separate errors. Firstly, Hildreth knew nothing of the *Unio crassus* Say, but only knew the quite different conception of "*crassus*" had by *Mr. Barnes!* Secondly, the "earlier naturalists" did not consider Hildreth's species as being at all closely related to either the *crassus* of Say nor to that of Barnes!

With one accord, Say, Conrad, Ferussac (and other lesser lights), placed Hildreth's species in the synonymy of the *Unio subrotunda* Rafinesque. Dr. Lea, who was ever on the alert to

save his own names, rescued his name of *Unio circulus* by placing Hildreth's *orbiculatus* in the synonymy of the closely allied *Unio torsus* Rafinesque, in his first list of American Unio (1829).

But Say died in 1834, and two years later Dr. Lea issued his first Synopsis of the Naiades (1836), and in this work he changed his placement of Hildreth's species, giving it as the antecedent of *Unio abruptus* Say.

Because of the absence of Say, and the practical inaccessibility of Hildreth's description, the last, *but by no means the best*, guess of Lea has been accepted ever since.

In the work cited of Call (p. 493) the description given by Hildreth was said to be "repeated", but by some miscue, perhaps the most important portions of the original were omitted in the reprint!

The writer will not undertake to copy Hildreth's description, since the greater part of it applies as well to any Unio, but will merely cite a few of the original criteria, showing how impossible its identification as being the *Unio abruptus* Say is. Since Hildreth (in common with Barnes and others) mistook the "anterior for the posterior", such portions of his observations as embrace this conception will be changed to suit modern usage.

"Shell nearly round; inflated; length 2.5, altitude 2.5, diameter 1.75." The critical student will note that the above corresponds *exactly* with some specimens of the ("*U. torsus*"), modern *Obovaria retusa* Lamarck, but absolutely not with any *Unio abruptus* Say thus far recorded!

"Posterior lunule broad heart shaped". Here again we have a feature often to be seen in the *retusa*, but a "broad heart shaped" posterior view of the *abruptus* has yet to be seen. It might be well to note also, that the above observation carries with it the implicit statement, that the beaks of the species are "*incurved*"—a feature often seen in *retusa* but scarcely in the other.

"Beaks somewhat prominent; projecting forward". It is scarcely worth while calling the attention of the reader to the direction in which the above observation leans.

"Cardinal teeth elevated, angulated, deeply sulcated". As

to the cardinal teeth of "*abruptus*", Call himself (ibid. page 492) writes that they are "nearly smooth", in which he is correct. Those of the "*retusa*", the reader may prove by inspection of several, are in fact, remarkably "sulcated".

"Nacre flesh color, and very iridescent with purple and violet". Such coloring in the *abruptus* has never been seen by the writer, but applies very well to some specimens of the *retusa*. The nacre of the latter is generally said to be "deep purple", but it is sometimes white, and sometimes with a blush of pink; especially when young.

An attentive reading of Hildreth's description will show that his shell was correctly placed by the earlier naturalists—for it must be remembered that the several species called *subrotunda*, *torsus* etc., might have been lumped together by them. Say at any rate never mentioned the *torsus* or *retusa* in any of his writings.

Whether Hildreth's species be the *subrotunda* or the *retusa* is merely of academic interest; the facts which interest us being that it is absolutely *not* Say's species, *Unio abruptus;* and the latter name, after resting in the synonymy for almost a hundred years, must be used as the valid name of what has been incorrectly called *Unio orbiculatus* Hildreth.

GAYLE, LOUISIANA.

NOTES ON THE ANATOMY AND TAXONOMY OF CERTAIN LAMPSILINAE FROM THE GULF DRAINAGE

BY A. E. ORTMANN, PH. D.

(*Continued from page 105*)

8. MICROMYA VANUXEMENSIS UMBRANS (Lea) (1857).

See: *Lampsilis propria* and *umbrans=vanuxemensis*, Simpson, 1914, p. 105 and 103.

E. vanuxemensis, of the Cumberland-Tennessee-system, has also been reported from the upper Coosa drainage. The following accepted synonyms are from this region.

U. umbrans (=*umbrosus*), Lea, 1857. A typical female in shape, with dark brown epidermis and dark purple nacre.—Othcalooga Creek, Gordon Co., Ga.

U. tenebricus Lea, 1857. The figure represents a male, with dark brown epidermis and purple or salmon nacre.—Etowah River, Ga.

U. fabaceus Lea, 1861. A male, not full grown. Epidermis dark brown, nacre purplish and salmon near the margin.—Oostanaula River, Ga.

Another, very closely allied form, has been reported from this region: *U. proprius* Lea (1865). Simpson (p. 104) suspects that it may be only a smaller and paler form of *vanuxemensis*. It originally comes from Lafayette, Walker Co., Ga. (headwaters of Chattooga River). But, remarkably enough, Simpson gives it also from Clinch River, Va. Now, in the upper Tennessee region, occasional specimens of *vanuxemensis* turn up which are lighter in color of the epidermis and nacre, and, if they are also small, they would very well agree with *proprius*. But in this region, they form only an individual variation, and a very rare one.

In the Coosa drainage, specimens with lighter color of epidermis and nacre prevail, as is shown by the rich material from this region before me. But they are by no means smaller than the normal *vanuxemensis*. There are specimens fully as large as the general run of *vanuxemensis* in the upper Tennessee, although, exactly as in the latter, they seem to remain uniformly smaller in certain creeks. On the other hand, with regard to the color of the epidermis and nacre, there are, in the Coosa drainage, specimens fully as dark as the normal *vanuxemensis*, but such specimens are rare, and, if found, are mostly associated with lighter ones. From many places, only the light form is at hand. As a rule, old and worn specimens are the ones which incline toward the darker tints. Thus we have the following conditions: in the Tennessee-drainage, there is a dark form, the typical *vanuxemensis*, which rarely shows an inclination to become lighter; in the Coosa drainage, there is a light form, which sometimes shows an inclination to become darker. The light shells from the Tennessee cannot be distinguished from the normal Coosa-form; and the dark shells of the latter cannot be told apart from the normal Tennessee-form. These are exactly the conditions which are required for the separation of these forms as varieties of *one* species.

The normal form of the Coosa has been called *U. proprius* Lea (1865). However, also *umbrans*, *tenebricus*, and *fabaceus* belong to this stock, the oldest name being *umbrans* Lea (1857) (has only page precedence over *tenebricus*). Unfortunately, this name, founded upon two females only, stands for the dark phase of the Coosa-form, and the same is true also for *tenebricus* and *fabaceus*. But they cannot be separated upon this ground from the lighter form (*proprius*); they are simply individual variations of it.

I have two males from Othcalooga Creek, which are topotypes of *umbrans*, and they have the epidermis olive-brown near the beaks, but lighter (light brown) upon the sides. In the larger, the nacre has that beautiful, characteristic salmon tint of the Coosa-form; the smaller is pale salmon inside, whitish on the margin. Already Lea says, that there is a "disposition to yellowness" on the sides. Thus I have no doubt that he had only two unusually dark specimens before him.

The name of the Coosa-form should be: *Micromya vanuxemensis umbrans* (Lea) (1857), with the synonyms: *U. tenebricus* Lea (1857); *U. falaceus* (1861); *U. proprius* Lea (1865).

I have investigated the anatomy of the following material.

Conasauga River, Conasauga, Polk Co., Tenn.—1 barren, 2 gravid females (with glochidia), A. E. Ortmann coll., May 24, 1915,

Shoal Creek, St. Clair Co., Ala.—1 male, 2 gravid females (with glochidia), H. H. Smith coll., Oct., 1914.

Morgan Creek, Shelby Co., Ala.—5 males, 2 barren females, H. H. Smith coll., July 3, 1914.

The structure of the soft parts is absolutely identical with that of the typical *vanuxemensis* (see: Ann. Carn. Mus. 8, 1912, p. 342; NAUT. 1915, p. 65; 34, 1921, p. 91). Also here the glochidia vary a little in size: L. 0.21 to 0.23, H. 0.27 to 0.30 mm.

Attention should again be directed to the geographical distribution. This species is found, first, in the Cumberland-Tennessee drainages; then there is an Alabama-form closely allied to it, so that it can be separated only as a variety, indicating that it must have reached the Coosa-drainage by crossing over

from the Tennessee. The complete absence of this type of shell from the Mississippi valley, the coastal plain, and the lower parts of the Alabama-system, renders the idea impossible that it might have come from those parts, migrating from West to East.

9. Micromya lienosa concestator (Lea) (1857).

See: Simpson, 1914, p. 100 and 102.

Simpson admits the close affnity of *concestator* to *lienosa*, and says that *lienosa* differs in being larger and solider, in being darker and not quite so shining. It is said to be found from the Mississippi and lower Ohio drainage to southwestern Georgia, with the type-locality in southern Alabama, while *concestator* is said to be distributed from North Carolina to Louisiana, and possibly Texas. *M. lienosa* thus would be more western and northern, *M. concestator* more southern and eastern, the two forms overlapping in the Gulf drainage.

Examining my material, which comes from nearly the whole range of these two forms (Ga., Ala., Miss., La., Ark., Ky., and Ind.) I am able to verify these differences at least to a certain degree, but surely size and solidity do not hold good. Specimens from the West, indeed, generally are rather black in color, but I observe the same color in specimens from the Choctawhatchee drainage in southeastern Alabama and from the Chattahoochee in Georgia. Individuals with more brownish epidermis, and then often with more distinct rays, it is true, are more abundant towards the East, but in Alabama they are often associated with and grade into more blackish forms, so that no sharp line can be drawn.

These conditions make it impossible to distinguish the two forms as *species*. The best we can do is to separate them as *varieties*, and to call the more eastern, brownish form: *Micromya lienosa concestator*. But we must remember that there will be cases where it is hard to decide to which form a particular specimen may belong.

Among a number of specimens received from the Alabama Museum and labeled by Walker, it is very evident that this difficulty was encountered. Of specimens labeled *concestator*, I have soft parts from the following localities.

Choctawhatchee River, Blue Springs, Barbour Co., Ala.—2 males, H. H. Smith coll., May 11, 1915.

East Choctawhatchee River, Dale Co., Ala.—1 male, 1 gravid female (glochidia), J. A. Burke coll., Nov., 1915.

The anatomical structure of these is identical with that of *M. lienosa* as described previously (Ann. Carnegie Mus. 8, 1912, p. 340, and NAUT. 30, 1916, p. 55). Also the glochidia are of the same shape and size (see: ibid. 1912, pl. 20, f. 5).

10. LAMPSILIS CLAIBORNENSIS OBTUSA (Lea) (1840). (Synonym of L. *claibornensis*, according to Simpson, 1914, p. 70).

From the Choctawhatchee drainage I have 5 shells labeled *Lampsilis obtusa* by Walker. They fully agree with Lea's description of this form, and H. H. Smith remarks: "Simpson makes this a synonym of *claibornensis*: I should call it a good subspecies anyway".

These specimens differ from *claibornensis* in having a more delicate shell and the color of the posterior slope, which is dark brown (or dark greenish in young shells), contrasting with the yellowish of the rest, and produced by the confluence of the indistinct rays. This form might be, indeed, a local race of *claibornensis*, belonging to the Choctawhatchee and Chattahoochee Rivers, or even a species taking its place in these parts; the final decision depends, however, on the investigation of more material.

The affinity of this form to *claibornensis* is clearly shown in its anatomy. I have received the following soft parts.

Choctawhatchee River, Blue Springs, Barbour Co., Ala.—1 gravid female (with glochidia) (without the shell), H. H. Smith coll., May 11, 1915.

Pea River, 4 miles N. of Elamville, Barbour Co., Ala.—2 young males (shells and soft parts) J. A. Burke coll., Nov., 1915.

The gravid female has the anatomy agreeing with that of *L. claibornensis* (and that of *L. siliquoidea*, for that matter) (see: Ann. Carn. Mus. 8, 1912, pp. 348, 349). The "large dark papillae below the branchial opening", described by Lea (1863, p. 406) for *obtusus*, undoubtedly refers to the "flap", the projecting anterior portion of the inner edge of the mantle in front

of the branchial. The glochidia have also been described and figured by Lea (1858, p. 46, pl. 5, f. 1), and their measurements given as: L. 0.192, H. 0.256. I found them to agree with those of *claibornensis*: L. 0.21, H. 0.27 mm.

11. Lampsilis excavata (Lea) (1857).

See: Simpson, 1914, p. 41.

When I described the anatomy of this species (Ann. Carn. Mus. 8, 1912, p. 352), I did not have any females. The glochidia were known then from the description and figure given by Lea (1874, pl. 21, f. 6). I have now the following soft parts.

Forks of the Black Warrior River, Walker Co., Ala.—1 gravid female, H. H. Smith coll., Oct. 15, 1912.

This female shows the mantle flap developed exactly as in *L. ovata* (Say) (and related forms); posteriorly, it is lamellar with almost smooth edge (only with traces of crenulations); anteriorly, it projects in the shape of a lacerated lobe. On the inside, there is a black-brown streak.

The glochidia are subovate, of the same shape as in *L. ovata*, L. 0.20 to 0.21, H. 0.24 to 0.25 mm. This differs from the dimensions given by me previously for *L. ovata* and *L. ovata ventricosa* (as: L. 0.24 to 25, H. 0.28 to 0.29). *These latter dimensions, however, are a mistake.* Subsequent measurements of my old material have shown that the figures are the same as in *L. excavata*. Also the glochidia of *L. ovata satura*, L. 0.22, H. 0.25 (Naut. 30, 1916, p. 56) agree with these. Already Surber (Bur. Fisher, doc. no. 771, 1912, p. 9) has correctly given the dimensions of the glochidia of *L. ovata ventricosa* as: 0.205 × 0.255, and of *L. satura* (ibid. no. 813, 1915, p. 6) as: 0.205 × 0.245 mm.

12. Lampsilis clarkiana (Lea) (1852).

Synonyms: *Unio clarkianus* Lea (1852); *U. spilmani* Lea (1861); *U. gerhardti* Lea (1862). (Simpson, 1914, pp. 53, 54, makes the first two synonyns, while he has the third as a separate species).

The *type-locality* of *U. clarkianus* is said to be Williamsport, Maury Co., Tenn. (on Duck River), but there is no doubt that

this is a mistake. Lea gives also: Georgia *or* Alabama, and Simpson specifies: Cahaba and Black Warrior Rivers, Ala.

U. spillmani is from "Luxpalila Creek" (=Lookapallila or Floating Turtle Creek), near Columbus, Lowndes Co., Miss. (Tombigbee drainage), and *U. gerhardti* is given from "Chattanooga, Ga.", which probably means Chattooga River, Ga. (trib. to Coosa). In addition, Simpson gives for this: Shorter, Macon Co., Ala. (Tallapoosa drainage). Thus these forms seem to be widely distributed over the Tombigbee-Alabama system.

All these forms resemble each other in general shape, and differ only in color of epidermis and nacre. Simpson has already united the first two; but I have no doubt that also *gerhardti* is the same shell. This differs only by the generally lighter, yellowish, color of the epidermis, with poorly developed rays, while the others are yellowish, brownish or blackish, with or without rays. A specimen collected by myself in Chattooga River is to be regarded as a *topotype* of *gerhardti*, and closely resembles this form. But I cannot sharply distinguish it from others before me, which resemble the darker *clarkianus*-type, because there are all transitions.

This species is analogous to *L. ovata ventricosa* (Barnes) of the interior basin. The color of the epidermis varies a good deal, from yellowish (chiefly in younger shells) to brownish, sometimes quite dark brown. Rays may be absent or present, narrower or wider. The nacre is whitish, often tinted salmon in the cavity. It is a rather compressed shell, and resembles, in shape, the male of *L. ovata ventricosa*, but is slightly more elongated. The greatest difference from the latter, however, is found in the postbasal expansion of the female, which, in *clarkiana*, is much less developed, and situated more anteriorly, so that the female shell is not subtruncated posteriorly, but produced into a point. The male and female shells are comparatively little differentiated, so that it is hard to tell them apart; there is a gentle projection in the postbasal region of the female, but this does not reach, by any means, the proportions seen in *ventricosa*.

I have the following material:

Conasauga River, Conasauga, Polk Co., Tenn.—1 female, with soft parts, coll. by myself, May 24, 1915.

Chattooga River, Trion, Chattooga Co., Ga.—1 gravid female (with eggs), coll. by myself, May 19, 1915.

Beaver Creek, St. Clair Co., Ala.—1 specimen, probably male, H. H. Smith coll. (identified by Walker as *clarkiana*).

Coosa River, Coosa Valley, St. Clair Co., Ala.—1 spec., young, H. H. Smith coll. (identified by Walker as *clarkiana*).

Choccolocco Creek, Jackson Shoals, Talladega Co., Ala.—1 spec., young, H. H. Smith coll. (identified by Walker as *clarkiana*).

Talladega, Talladega Co., Ala.—1 spec., probably male, Hartman collection (originally labeled *spillmani*).

Sipsey River, Elrod, Tuscaloosa Co., Ala.—2 spec., probably females, H. H. Smith coll. (labeled by Walker *clarkiana*).

Buttahatchee River, Hamilton, Marion Co., Ala.—7 spec., at least 2 females among them, H. H. Smith coll. (labeled by Walker *clarkiana*).

It should be noted that all specimens from the Tombigbee drainage have more brownish epidermis (lighter or darker), while yellowish epidermis prevails in shells from the Coosa system, yet a few of the latter are also brownish.

Of the two females I collected with soft parts, the one taken on May 19 in Chattooga River has eggs, but not glochidia. This would indicate the beginning of the breeding season in the spring, and is *entirely abnormal.* But it is known that also in other cases the breeding season becomes irregular in the southern states.

The anatomy agrees with that of *L. ovata ventricosa*, *excavata*, and related forms. The mantle flap is similar to that of these forms, with a free lobe anteriorly, not very distinct in my specimens, since it is contracted by the action of the alcohol, but several large teeth or lacerations are seen. The edge of the posterior part of the flap is nearly smooth, with a few indistinct crenulations. Also the color on the inside is normal: brownish, with a black longitudinal streak, but, on account of the contracted condition, I cannot recognize that peculiar eye-spot. There is no question that this species belongs in the *ovata*-group of *Lampsilis.*

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